

IN THE UNITED STATES DISTRICT COURT FOR THE  
NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his )  
capacity as ATTORNEY GENERAL )  
OF THE STATE OF OKLAHOMA and )  
OKLAHOMA SECRETARY OF THE )  
ENVIRONMENT C. MILES TOLBERT, )  
in his capacity as the )  
TRUSTEE FOR NATURAL RESOURCES )  
FOR THE STATE OF OKLAHOMA, )

Plaintiff, )

vs. ) 4:05-CV-00329-TCK-SAJ

TYSON FOODS, INC., et al, )

Defendants. )

- - - - -

VOLUME I OF THE VIDEOTAPED  
DEPOSITION OF INDRAJEET CHAUBEY, PhD, produced  
as a witness on behalf of the Plaintiff in the above  
styled and numbered cause, taken on the 27th day of  
January, 2009, in the City of Tulsa, County of  
Tulsa, State of Oklahoma, before me, Lisa A.  
Steinmeyer, a Certified Shorthand Reporter, duly  
certified under and by virtue of the laws of the  
State of Oklahoma.

## A P P E A R A N C E S

FOR THE PLAINTIFFS: Mr. Richard Garren  
 Attorney at Law  
 502 West 6th Street  
 Tulsa, OK 74119  
 -and-  
 Ms. Kelly Hunter Burch  
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 Oklahoma City, OK 73105  
 -and-  
 Mr. Louis Bullock  
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 110 West 7th Street  
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 Tulsa, OK 74119

FOR TYSON FOODS: Mr. Robert George  
 Attorney at Law  
 2210 West Oaklawn Drive  
 Springdale, AR 72762  
 (Via phone)

FOR CARGILL: Ms. Leslie Southerland  
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 100 West 5th Street  
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 Tulsa, OK 74103  
 (Via phone)

FOR PETERSON FARMS: Ms. Nicole Longwell  
 Attorney at Law  
 320 South Boston  
 Suite 700  
 Tulsa, OK 74103

FOR GEORGE'S: Ms. K. C. Tucker  
 Attorney at Law  
 221 North College  
 Fayetteville, AR 72701  
 (Via phone)

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## I N D E X

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FOR CAL-MAINE: Mr. Robert Sanders  
 Attorney at Law  
 2000 AmSouth Plaza  
 P. O. Box 23059  
 Jackson, MS 39225  
 (Via phone)

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(Whereupon, the deposition began at  
 8:52 a.m.)

COURT REPORTER: We are now on the Record.  
 Would counsel please announce themselves?

MR. GEORGE: Robert George for the Tyson 08:52AM  
 defendants.

MR. SANDERS: Bob Sanders for the Cal-Maine  
 defendant.

MS. TUCKER: K. C. Tucker for the George's  
 defendants. 08:53AM

MS. SOUTHERLAND: Leslie Southerland for  
 Cargill.

MS. LONGWELL: Nicole Longwell on behalf of  
 Peterson Farms.

MR. GARREN: We have Richard Garren for the 08:53AM  
 State of Oklahoma.

MR. BULLOCK: And Louis Bullock for the  
 State of Oklahoma.

INDRAJEET CHAUBEY, PhD  
 having first been duly sworn to testify the truth,  
 the whole truth and nothing but the truth, testified  
 as follows:

## D I R E C T E X A M I N A T I O N

BY MR. GARREN:

Q Dr. Chaubey, would you please tell the court 08:53AM

5

1 your full name?  
2 A Indrajeet Chaubey.  
3 Q All right. Dr. Chaubey, have you ever given a  
4 deposition before?  
5 A No, I have not. 08:53AM  
6 Q What's going to occur today -- let me give you  
7 some helpful hints, if you will, about what we are  
8 doing. I'll ask questions. At some point in time  
9 there may be other attorneys to ask questions, too,  
10 but the intent here is, because we have a court 08:53AM  
11 reporter, that your responses be made audibly so she  
12 can take down your response, and it's even more  
13 important today since we're doing a lot of people on  
14 the phone. Secondly, if you don't understand my  
15 question or others' questions, please let me know or 08:54AM  
16 indicate that you are not able to understand it and  
17 I'll try to rephrase it so that we're clear in our  
18 understanding of what I'm asking and what it is you  
19 are responding to. All right? You'll need to  
20 respond verbally then. Do you understand that? 08:54AM  
21 A Yes.  
22 Q All right, and I know you do have a dialect,  
23 and we've spoken before, so I will try to do my best  
24 not to speak over you, and if you'll do the same  
25 with me, I'll try and get my questions in, and I'll 08:54AM

6

1 wait for you to finish your answer before asking  
2 another one so that the court reporter can get that  
3 down. With others being on the phone today and  
4 making objections, it will be a little more  
5 distracting I think so if they do make an objection, 08:54AM  
6 wait until it's completed and then we'll go forward  
7 with your responses. All right?  
8 A Okay.  
9 Q We will take periodic breaks. At any time you  
10 feel like you want to take a break and we haven't 08:54AM  
11 taken one, let me know and we'll do that. All  
12 right?  
13 A Okay.  
14 Q Tell the court where you reside.  
15 A I live in West Lafayette, Indiana. 08:55AM  
16 Q And you're employed there; correct?  
17 A I am employed at Purdue University.  
18 Q Since you agreed to appear and testify, have  
19 you been contacted by any of the poultry integrator  
20 defendant lawyers in this case? 08:55AM  
21 A Yes. I got subpoena and a phone call from  
22 Robert George and Michael --  
23 Q Bond?  
24 A Bond, yes.  
25 Q All right. When did that call occur; do you 08:55AM

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remember?  
A It occurred last week.  
Q All right, and they called you?  
A Yes.  
Q And what did they say when they called you? 08:55AM  
A I guess the conversation was they wanted to  
know if I was a paid expert on this case and if I  
was going to take any side and wanted to know what  
it was going to be about.  
Q And did you respond to their question whether 08:55AM  
you were a paid expert?  
A Yes, I did respond to that question.  
Q What was your response?  
A I am not a paid expert.  
Q All right. Did they ask you any other 08:56AM  
questions or make any other statements to you in  
that conversation?  
A I recall I think one of the questions was if I  
understood some of the comments I make could  
potentially determine the liability in this case. 08:56AM  
Q Did those statements to you make you feel  
uncomfortable in any way?  
A No, it did not.  
Q Okay. Now, you and I have spoken before  
today; is that correct? 08:56AM

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A Yes.  
Q One time at your office and one time in my  
office yesterday; is that true?  
A Yes.  
Q All right. In those discussions, were you 08:56AM  
asked to say anything you could not believe was  
true?  
MS. LONGWELL: Object.  
A No.  
Q Has anyone for the State of Oklahoma or its 08:57AM  
attorneys requested that you render an opinion in  
connection with the facts in this case?  
A No.  
Q Have you seen the complaint filed by the State  
of Oklahoma against the poultry integrator 08:57AM  
defendants in this case?  
A No.  
Q Do you know, in fact, who all the defendants  
are in this case?  
A No, I do not. 08:57AM  
Q You heard lawyers this morning announce for  
various companies, did you not?  
A Yes.  
Q Other than that, have you heard the names of  
the defendants in this case? 08:57AM

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1 A No. This is the first time I heard some of  
2 those names.  
3 **Q Do you know a gentleman by the name of Bernard**  
4 **Engel?**  
5 A I know him. 08:57AM  
6 **Q How long have you known him?**  
7 A We have worked together for a little over two  
8 years now, and I've known him for more than seven or  
9 eight years.  
10 **Q All right, and where did you first meet him;** 08:57AM  
11 **do you recall?**  
12 A We first met in a conference, our professional  
13 American Society of Agricultural and Biological  
14 Engineering Conference.  
15 **Q All right. Have you looked at or read Dr.** 08:58AM  
16 **Engel's expert report that he prepared for this**  
17 **case?**  
18 A I have not.  
19 **Q Have you looked at any parts of it?**  
20 A No. 08:58AM  
21 **Q Have you discussed with Dr. Engel the nature**  
22 **and scope of his opinions contained in that report**  
23 **that he has prepared for this case?**  
24 A No, I have not.  
25 **Q Have you seen or read any of the expert** 08:58AM  
10

1 reports submitted by the defendants in this case?  
2 A No.  
3 **Q Have you looked at any or read any reports**  
4 **submitted by other experts submitted by the State of**  
5 **Oklahoma in this case?** 08:58AM  
6 A No.  
7 **Q Do you know the names of the experts used by**  
8 **the State of Oklahoma in this case?**  
9 A I do not.  
10 **Q Do you know the names of the experts used by** 08:58AM  
11 **the defendants in this case?**  
12 A I do not.  
13 **Q Have you been asked at any time to perform**  
14 **work for any expert who's identified himself to be**  
15 **an expert in this case?** 08:59AM  
16 A Can you ask that question again?  
17 **Q Have you been requested by any person**  
18 **identifying himself to be an expert in this case to**  
19 **do work for them?**  
20 A No. 08:59AM  
21 **Q Have you looked at or read any transcripts of**  
22 **either Dr. Engel or others in this case?**  
23 A No.  
24 **Q Have you been provided any data that was**  
25 **gathered by the State or people working on behalf of** 08:59AM  
11

the State of Oklahoma in this case?  
A No.  
**Q Have you been provided any data provided**  
through the defendants in this case?  
A No. 08:59AM  
**Q What, if any, encouragement or discouragement**  
has Dr. Engel provided to you for your testimony  
today, if any?  
A None.  
**Q Has Dr. Engel put any pressure on you to** 08:59AM  
testify?  
A No, he has not. I don't see how he can put  
pressure. I'm a tenured professor at Purdue. So no  
one can.  
**Q Have you been promised anything for your** 09:00AM  
testimony in this case?  
A No.  
**Q Have your expenses been paid to come to Tulsa?**  
A Yes.  
**Q And what expenses were those?** 09:00AM  
A Airfare and hotel.  
**Q All right. Have you, sir, in your**  
professional career at any time been requested  
directly by any of the defendants in this case to  
perform consulting work on their behalf? 09:00AM  
12

A No.  
**Q Have you performed any consulting work for the**  
State of Oklahoma in the past?  
A No.  
**Q Have you been retained to provide an opinion** 09:00AM  
about the State of Oklahoma experts' opinions?  
A No.  
**Q Have you been retained to consult with any of**  
the State's experts on any issue in this case?  
A No. 09:01AM  
**Q Have you been retained by anyone to provide**  
opinions as to the defendants' experts' opinions?  
A No.  
**Q Other than coming to testify today in Tulsa,**  
have you been asked by me or others for the State of  
Oklahoma to do any work on this case? 09:01AM  
A No.  
**Q Other than your coming today to testify, have**  
you been asked by me or others for the State of  
Oklahoma to form any opinions specifically in  
connection with this case? 09:01AM  
A No.  
**Q Let's talk a little bit about you, Dr.**  
Chaubey. I'm going to hand you what is Exhibit No.  
1. I'll represent to you that this is a document 09:02AM  
13

1 that I downloaded from the Purdue University, which  
2 appears to be, at least in part, a curriculum vitae.  
3 Would you agree with that?  
4 A Yes.  
5 Q And is this -- is the data that's on this 09:02AM  
6 maintained by you or under your direction?  
7 A Under my direction.  
8 Q Okay. Is the -- let's talk a little bit  
9 about -- first off, do you believe this is a full  
10 and complete curriculum vitae for you? 09:02AM  
11 A This is not complete particularly. It only  
12 partially presents my work.  
13 Q I'm going to ask some questions to give you an  
14 opportunity to kind of supplement some of the things  
15 on this. All right? 09:02AM  
16 A Okay.  
17 Q Let's start first with your degrees. You have  
18 the degrees listed here, and I'm going to take them  
19 in reverse order. Tell the court and the witnesses  
20 here, what is your bachelors of science degree in? 09:03AM  
21 A My bachelors of science degree is in  
22 agricultural engineering.  
23 Q And when did you obtain that degree?  
24 A In 1991.  
25 Q And at what university did you obtain that? 09:03AM

14

1 A It was from University of Allahabad in India.  
2 Q Now, you've obtained a masters degree also.  
3 It's in biological and agricultural engineering.  
4 Where did you obtain that?  
5 A At University of Arkansas. 09:03AM  
6 Q And what year was that?  
7 A 1994.  
8 Q All right. Did you have a supervisor in your  
9 masters thesis work at that university?  
10 A Yes. 09:03AM  
11 Q Who was that?  
12 A Dr. Dwayne Edwards.  
13 Q Is he also known as D. R. Edwards?  
14 A Yes.  
15 Q All right. What was the thesis that you -- 09:04AM  
16 general subject matter of the thesis that you  
17 provided for your masters?  
18 A I investigated how filter strips or buffer  
19 strips can be used as a best management practice to  
20 filter some of the water quality constituents from 09:04AM  
21 land-applied poultry litter and swine manure.  
22 Q All right. You then obtained a PhD. Where  
23 was that obtained?  
24 A Oklahoma State University.  
25 Q And what was the degree obtained there? 09:04AM

15

A Biosystems engineering.  
Q And what year was that degree obtained?  
A 1997.  
Q Did you have a thesis captain or director in  
your work there? 09:04AM  
A Yes.  
Q Who was that?  
A It was Dr. C. T. Hahn.  
Q What was the general subject of the thesis  
that you prepared for your doctorate? 09:05AM  
A It was in the area of hydrology and watershed  
modeling. I investigated how different  
uncertainties relate to model inputs and parameters.  
Q Okay. Let's talk a little bit about the  
awards and honors you have listed here. There are 09:05AM  
several, but are these all of the ones that you have  
obtained?  
A No. Actually, what I consider the most  
significant is not listed here.  
Q What is the award or honor that is significant 09:05AM  
to you that's not listed?  
A It is New Holland Young Researcher Award. It  
is given by American Society of Agricultural and  
Biological Engineering to one researcher every year  
younger than 40 years old. 09:05AM

16

Q So what was the year of that?  
A It was 2007.  
Q And what is your age today?  
A 40.  
Q 40. Are there any other awards or honors you 09:06AM  
wish to list that aren't otherwise listed on Exhibit  
1?  
A No. The rest are.  
Q Let's talk a little bit about your  
professional experiences. Other than those listed 09:06AM  
on this curriculum vitae, are there some omitted?  
Let me rephrase that. Are there other professional  
experiences that you think should be added to this  
that were not on it at the time this was prepared?  
A I am involved in some committees and 09:06AM  
assignments at Purdue which are not listed here.  
For example, I am on a steering committee of  
ecological sciences and engineering, and I am a  
founding member of equivalent to board of directors  
on division of environmental and ecological 09:07AM  
engineering at Purdue.  
Q All right. Are there any others?  
A No. Rest of the significant ones are listed  
here.  
Q All right. This particular document doesn't 09:07AM

17

1 have a listing for professional associations. Can  
 2 you tell the court and jury what those may be?  
 3 A I am a member of American Society of  
 4 Agricultural and Biological Engineering. I am also  
 5 a member of American Water Resources Association, 09:07AM  
 6 and two honor societies. One is Gamma Sigma Delta.  
 7 It's honor society in agriculture, and second one is  
 8 Alpha Epsilon, honor society in agricultural and  
 9 biological engineering.  
 10 Q Are there any others that you can think of 09:07AM  
 11 that you would wish to list today that aren't on  
 12 this Exhibit 1?  
 13 A Not really.  
 14 Q All right. Exhibit 1 does not list all of  
 15 your publications, does it? 09:08AM  
 16 A No, it does not.  
 17 Q All right. Let me hand you what's marked as  
 18 Exhibit No. 2, and I would represent to you this is  
 19 another download that I obtained from the website  
 20 there at Purdue. Can you identify this document for 09:08AM  
 21 the court, please?  
 22 A Yes. It is from my website. It is a list of  
 23 my publications, presentations, seminars, research  
 24 reports and other similar documents.  
 25 Q In looking at this list yesterday, did you 09:08AM  
 18

1 determine whether it was complete or not?  
 2 A It is not most up to date. It says that I  
 3 have 39 refereed journal articles. Since then that  
 4 number has increased to 43.  
 5 Q Let me hand you what I'm going to mark as 09:09AM  
 6 Exhibit 2A. Tell the court what that is.  
 7 A It comes from my letter CV. It is a list of  
 8 -- first page of my list of publications, and it has  
 9 got three additional refereed journal articles which  
 10 are not on the website. 09:09AM  
 11 Q Did you provide that document to me yesterday?  
 12 A I gave that to you yesterday.  
 13 Q All right. Are there any other publications  
 14 you may be currently working on that also are not on  
 15 this list? 09:09AM  
 16 A Yes. There are a number of publications which  
 17 are currently in progress.  
 18 Q Generally what is the scope or nature of those  
 19 and the subject matter that might be being  
 20 investigated? 09:10AM  
 21 A They all relate to non-point source pollution  
 22 and hydrology in agricultural watersheds.  
 23 Q What watersheds do they relate to that you are  
 24 doing this work in?  
 25 A A number of different watersheds. Some are 09:10AM  
 19

located in Arkansas; some are located in Indiana.  
 Q Are the ones in Arkansas connected to the or  
 related to the Illinois River watershed?  
 A Yes.  
 Q Are you familiar with that watershed? 09:10AM  
 A I am.  
 Q Do you know the boundaries of it generally  
 speaking?  
 A You mean boundaries of the Illinois River  
 watershed? 09:10AM  
 Q Of the Illinois River watershed.  
 A I understand the boundaries of the Illinois  
 River watershed.  
 Q Okay. Are there subwatersheds that you have  
 also been working with within the Illinois River 09:10AM  
 watershed?  
 A Yes.  
 Q What would that be?  
 A That will be Moores Creek, Lincoln Lake  
 watershed, which is a small subwatershed within IRDA 09:11AM  
 or Illinois River drainage area.  
 Q Okay. So I think I understand what you are  
 saying. Is the area you are speaking to only in  
 Arkansas and not Arkansas and Oklahoma?  
 A Yes. 09:11AM  
 20

Q All right. So the subwatershed, does it have  
 a name?  
 A Moores Creek watershed. It is also at times  
 referred as Lincoln Lake watershed.  
 Q All right. Has it ever been referred to as 09:11AM  
 Muddy Fork; do you know?  
 A It is part of the Muddy Fork watershed, yes.  
 Q Okay. Let's talk a little bit about your  
 employment history, if we can, sir. Starting with  
 when you were still studying -- or tell me when was 09:11AM  
 the first time that you took a paid position in or  
 around your bachelors degree or after it, sometime  
 in that starting time frame.  
 A So in 1992 in January I started my masters  
 degree at the University of Arkansas, and I was a 09:12AM  
 half-time research assistant, working 20 hours a  
 week on a research project.  
 Q What was the nature of the project that you  
 were working on there?  
 A I was involved in looking at land application 09:12AM  
 of poultry litter and swine manure and how that  
 results in water quality, constituent transport in  
 small controlled plots, and what different best  
 management practices could be considered to minimize  
 that impact. 09:12AM  
 21

1 Q With regard to that work, did it include  
2 bacteria transport as part of those constituents?  
3 A Yes, it did.  
4 Q All right, and that period of time was from --  
5 what were the dates of that work? 09:13AM  
6 A So it went from January 1992 to July 1994.  
7 Q Okay. Did you then obtain employment after  
8 that work in July of '94?  
9 A I started my PhD in August of 1994 at Oklahoma  
10 State University, and I was a half-time research 09:13AM  
11 assistant there, working 20 hours a week.  
12 Q What kind of work were you performing as a  
13 half-time research assistant?  
14 A I was involved in looking at hydrologic and  
15 water quality models, how do they work in different 09:13AM  
16 watersheds, how we can improve them, how we can  
17 reduce their uncertainty.  
18 Q Did you meet a gentleman by the name of Dr.  
19 Storm while at OSU?  
20 A Dr. Daniel Storm, yes. 09:13AM  
21 Q And did he participate in your PhD studies in  
22 any way?  
23 A He was a member of my PhD committee.  
24 Q After October '97, did you have additional  
25 employment? 09:14AM

22

1 A Yes.  
2 Q Tell us what that was.  
3 A I was assistant research scientist at  
4 University of Alabama from October 1997 until April  
5 2000. 09:14AM  
6 Q And what kind of work did you do as an  
7 assistant research scientist there?  
8 A I worked as a hydrologist and water quality  
9 modeler, again, in general, looking at water  
10 response to runoff, sediment, nutrients. 09:14AM  
11 Q Was that a full-time employment?  
12 A That was a full-time employment.  
13 Q After April 2000, did you secure employment  
14 elsewhere?  
15 A I became assistant professor at University of 09:15AM  
16 Arkansas.  
17 Q And what was the time frame that you were at  
18 University of Arkansas?  
19 A So from May 2000 until December 2006 I was  
20 there. 09:15AM  
21 Q All right, and did your position as an  
22 assistant professor change at any time during that  
23 period?  
24 A In 2005 I became -- I got tenured and I was  
25 promoted to associate professor. 09:15AM

23

Q All right. Where did you go after leaving  
University of Arkansas in December of '06?  
A So in January of 2007 I became associate  
professor at Purdue University.  
Q And were you hired there as a tenured 09:15AM  
professor?  
A No, I was not hired there as a tenured  
professor. I got tenure last year.  
Q You mentioned that you had done some work in  
the watershed of Indiana and then you've talked 09:16AM  
about the Illinois River watershed. Are there any  
other watersheds that you've had experience with  
besides those two? I say two. Let me back up. How  
many Indiana watersheds have you been involved with  
in doing your work or study? 09:16AM  
A At least half a dozen of Indiana watersheds  
I'm working on right now.  
Q Other than the Illinois River watershed, are  
there others in Arkansas that you've done work in?  
A I've worked in Beaver Lake watershed. I was 09:16AM  
involved in Eucha-Spavinaw watershed and a number of  
what I call priority watersheds in Arkansas.  
Q What kind of watersheds?  
A Priority watersheds.  
Q Priority watersheds, okay. Just briefly tell 09:17AM

24

the court, if you would, what kind of areas of study  
or investigation you were conducting in these  
various watersheds; are they consistent with what  
you've done in your degrees?  
A Yes. They are all related to agricultural 09:17AM  
watersheds and looking at different processes  
related to hydrology and water quality, how do these  
processes affect what gets transported from these  
watersheds, how we can mathematically model them and  
what kind of different management practices we can 09:17AM  
evaluate to see what happens.  
Q All right. How long now have you then -- I  
want to speak now basically about the Illinois River  
watershed or its subbasins. How long have you been  
directly involved in studying or investigating that 09:18AM  
watershed or its subbasins?  
A My masters thesis was based on work in the  
Illinois River watershed, and then when I came back  
as a faculty in 2000, since then I have been  
involved in a number of projects in the watershed. 09:18AM  
Q All right. So some of that work was in the  
early '90's and then again starting in around 2000?  
A Yes.  
Q All right. Did your work in the watershed  
include what I called field work study? 09:18AM

25



1 MS. LONGWELL: Object, form.  
2 A Yes.  
3 **Q Tell the court what field work study would be.**  
4 A Field work study would involve instrumenting,  
5 collecting data at the field scale and our 09:18AM  
6 developing mathematical models to investigate what  
7 happens in terms of hydrology and water quality at a  
8 scale typical of a field.  
9 **Q Do you have experience in actually taking**  
10 **samples then while in the field? 09:19AM**  
11 A I have done a lot of field experimentation and  
12 have been involved directly in collecting field  
13 data.  
14 **Q Has your experience involved setting up**  
15 **instrumentation which would remotely or 09:19AM**  
16 **automatically collect data also?**  
17 A Yes.  
18 **Q In your work in the Illinois River watershed,**  
19 **have you relied solely on just the data that you've**  
20 **collected or others under your supervision? 09:20AM**  
21 A Ask that question again.  
22 **Q In your work in the Illinois River watershed,**  
23 **is that work, and certainly the papers you've**  
24 **written, relying solely on the data that you collect**  
25 **or would it include data from others? 09:20AM**  
26

1 A No. It does involve data and publications  
2 from others who have worked in the watershed.  
3 **Q So you have read published literature that**  
4 **would have some impact on your study or**  
5 **investigation; is that correct? 09:20AM**  
6 A Yes.  
7 **Q Based on your experience, how would you**  
8 **characterize the volume of published literature and**  
9 **data that involves the Illinois River watershed?**  
10 A It is, in my opinion, a very well studied 09:20AM  
11 watershed. Compared to lots of other watersheds  
12 that I have experienced or seen, it is a data-rich  
13 watershed.  
14 **Q Do you know whether or not research and study**  
15 **is still ongoing with regard to the Illinois River 09:21AM**  
16 **watershed? By others first, let's ask that. Do you**  
17 **know if others are still doing studies in the**  
18 **Illinois River?**  
19 A I don't know for sure. There was some studies  
20 going on when I left and was different assignment to 09:21AM  
21 Purdue, so I assume they are still continuing.  
22 **Q Are you continuing to do any work in the**  
23 **Illinois River watershed?**  
24 A Yes.  
25 **Q And that area of work involves what? 09:21AM**

27

A I am funded by USDA to study in Lincoln Lake  
watershed different best management practices, how  
do they work, and some of the socio-economic factors  
associated with BMP adoption, implementation and  
maintenance. 09:22AM  
**Q Do you have any estimate of how long that work**  
**is going to continue?**  
A We are in fourth year of that project, so that  
will end in September of '09.  
**Q All right. Tell me, what are some of the 09:22AM**  
**sources of data that you have reviewed either**  
**through literature or downloaded that became part of**  
**your study or your work or your experience?**  
MS. LONGWELL: Object to form.  
A Besides my own data, I have worked with the 09:22AM  
data that have been collected by Arkansas Water  
Resources Center, Arkansas Natural Resources  
Commission and Arkansas Department of Environmental  
Quality. I have worked with some GIS data that have  
been compiled and are housed by Center For Advanced 09:23AM  
and Special Technology, which is part of University  
of Arkansas. So they come from a variety of  
sources.  
**Q Is USGS also a source?**  
A Yes, of course, USGS is also a source of that 09:23AM  
28

data.  
**Q And at any time do you rely on USDA**  
**publications and censuses and similar data?**  
A Yes.  
**Q You've mentioned Arkansas Water Resource 09:23AM**  
**Center. Tell the court what that is and what kind**  
**of job it performs.**  
A Arkansas Water Resources Center is a center.  
I believe every state in the U.S. has got a similar  
center. The name may or may not be exactly the 09:24AM  
same. It's partially funded by USGS, by federal  
government, and mandated to work with and compile  
studies related to hydrology and water quality in  
the state.  
**Q When you were at the University of Arkansas, 09:24AM**  
**were you working in or with the AWRC?**  
A I worked quite a bit with AWRC.  
**Q All right. Who were some of the other people**  
**there that were at the AWRC when you worked there?**  
A Dr. Marc Nelson, who was with AWRC, he was my 09:24AM  
collaborator on almost all of the projects that  
involved data collection. I worked with Dr. Ralph  
Davis.  
**Q Ralph Davis?**  
A Yes. 09:25AM

29



1 Q All right.  
2 A And I did some work with Dr. Tom Soerens.  
3 Q Would you confer with others there besides the  
4 ones you've just mentioned?  
5 A Would I confer with others? 09:25AM  
6 Q Yeah, others that you've not mentioned in any  
7 of your work.  
8 A Yes.  
9 Q Did you peruse the literature and review it  
10 that's generated out of the Arkansas Water Resource 09:25AM  
11 Center during your work there?  
12 A Yes.  
13 Q So how long were you connected with work at  
14 the Water Resource Center there?  
15 A From 2000 to 2006 until I left for Purdue. 09:25AM  
16 Q Okay. Describe generally the nature of the  
17 work that you performed while at the Arkansas Water  
18 Resources Center.  
19 A So I was collaborating with Arkansas Water  
20 Resources Center. I want to make it clear. I was 09:26AM  
21 not employed at the Arkansas Water Resources Center.  
22 Q So you were actually employed by the  
23 university and collaborated --  
24 A Yes, collaborated with AWRC, and AWRC was  
25 facilitating a few of my projects. What was the 09:26AM  
30

1 question again? I'm sorry.  
2 Q Well, I guess you probably answered my  
3 question, but generally what was the scope of the  
4 work that you performed, the nature of the subject  
5 that you studied? 09:26AM  
6 A They all related to agricultural watersheds,  
7 hydrology, water quality from non-point source  
8 pollution.  
9 Q And did you conduct field investigations  
10 through your collaboration with AWRC? 09:27AM  
11 A Yes.  
12 Q In your work at Arkansas, did you have an  
13 opportunity to acquaint yourself with the type of  
14 agricultural practices that are performed in the  
15 IRW? 09:27AM  
16 A Yes.  
17 Q Describe generally what is the makeup of the  
18 IRW as you observed it.  
19 A Do you mean --  
20 Q Land use, let's start with land use. What 09:27AM  
21 kind of or land types do you see in the watershed?  
22 A The watershed is a mixed land use watershed.  
23 It's predominantly pasture areas. I believe about  
24 55 percent of the watershed is pasture.  
25 Q All right. 09:28AM  
31

A About 35 percent is forest. So that's about  
90 percent, and rest are in other categories.  
Q All right. Do you know what the approximate  
percentage of the urban area is in the Illinois  
River watershed? 09:28AM  
A So it has to be less than 10 I would think.  
More like 6 or 7 percent; no more than that.  
Q Based on your knowledge and skill and  
education, training and experience, including  
reading published literature, do you have an opinion 09:28AM  
what is the primary method used for poultry waste  
disposal?  
MS. LONGWELL: Object to form.  
A Yes.  
Q What is that opinion? 09:28AM  
A Land application, surface application of  
poultry litter.  
Q All right. From your review of published  
literature, do you have any knowledge of  
approximately how long land application of poultry 09:29AM  
waste has occurred in the IRW?  
MS. LONGWELL: Object to form.  
A Can you ask that question again?  
Q I will. From your review of literature or  
other sources, do you have knowledge of 09:29AM  
32

approximately how long poultry waste has been  
generally land applied in the IRW?  
MS. LONGWELL: I'm just going to state a  
continuing objection to the term waste. I think  
that's traditional, but that way I'm not going to 09:29AM  
continue to object just because you use that word.  
MR. GARREN: All right.  
A Yes.  
Q Approximately how long have you learned that  
would be? 09:29AM  
A For a long time. I mean, since poultry  
industry has been concentrated in northwest  
Arkansas.  
Q All right. When I use the term waste, let me  
maybe define that so that you and I have an 09:29AM  
understanding, too. I define waste as the  
excrement, the bedding material and things such as  
feathers or wasted feed and moisture that occurs  
that's taken out of the house at the conclusion of  
the growing session, sometimes commonly referred to 09:30AM  
as poultry litter in Arkansas. Do you know the term  
poultry litter?  
A Yes.  
Q And can you tell me what you understand the  
term poultry litter would mean? 09:30AM  
33

1 A Poultry litter indicates a combination of  
2 poultry manure and bedding material that is in  
3 poultry houses, what comes out after cleaning.  
4 **Q All right. So if I use the term poultry**  
5 **waste, do you understand that it's similarly as** 09:30AM  
6 **you've defined poultry litter?**  
7 MS. LONGWELL: Object to form.  
8 A Yes.  
9 **Q Okay. Based upon your experience, knowledge,**  
10 **review of published literature, do you have an** 09:31AM  
11 **opinion of how far from the poultry barn the poultry**  
12 **waste is usually taken to be land applied?**  
13 MR. GEORGE: Object to the form. Rick, I  
14 want to elaborate for a moment on my objection.  
15 It's apparent to me that the plaintiffs are now 09:31AM  
16 trying to solicit opinions from Dr. Chaubey beyond  
17 those that he has previously expressed in any  
18 literature, and by virtue of that, are trying to  
19 turn Dr. Chaubey into yet another expert witness for  
20 the State of Oklahoma, and the opinions that are 09:31AM  
21 elicited in this deposition in that context are  
22 untimely, and the defendants object to it.  
23 MR. GARREN: And in response, I'm certainly  
24 asking him from his personal experience facts and  
25 other observations he's made, and I will reask the 09:31AM

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1 question.  
2 **Q Based upon your personal experience, your**  
3 **observations, including your training and reading of**  
4 **published literature, do you have any idea or**  
5 **opinion about how far waste is generally taken from** 09:32AM  
6 **the poultry barn to be land applied?**  
7 MR. GEORGE: Same objection.  
8 MS. LONGWELL: Object to form.  
9 A Yes.  
10 **Q Tell us what you know.** 09:32AM  
11 A My understanding is that it does not travel  
12 too far. Economically it's not viable to transport  
13 poultry litter beyond a few kilometers from where  
14 it's generated.  
15 **Q With regard to that poultry litter or waste,** 09:32AM  
16 **in your study and in your investigations revolving**  
17 **around BMPs and water quality, is it important to**  
18 **know when poultry waste is land applied?**  
19 MS. LONGWELL: Object to form.  
20 A Yes. 09:32AM  
21 **Q And in your work in the IRW, have you learned**  
22 **from either personal experience, observation or**  
23 **published literature, when poultry waste is**  
24 **generally applied, when it is? What time of year is**  
25 **my question.** 09:33AM

35

A Mostly in the spring, from the spring until  
into the fall pretty much.  
**Q All right. In your study and investigation of**  
**poultry waste, its use and its effect on water**  
**quality, have you learned the nature and extent of** 09:33AM  
**the constituents contained within it?**  
MS. LONGWELL: Object to form.  
A Yes.  
**Q What have you learned is the general**  
**constituents of poultry waste?** 09:33AM  
A The microconstituents are water, carbon,  
nitrogen and phosphorus, and there are some  
micronutrients such as copper, iron, arsenic and  
others.  
**Q Is zinc one of the micronutrients that are** 09:34AM  
**found?**  
A I think so.  
**Q Does poultry waste to your knowledge contain**  
**bacteria?**  
A Yes. 09:34AM  
**Q You mentioned earlier that you've done work in**  
**Moore's Creek. Let me hand you what is Exhibit 3.**  
**Can you tell the court what this document is?**  
A This is a final report for a project named  
Optimizing BMPs, Water Quality and Sustained 09:35AM

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Agriculture in the Lincoln Lake Watershed that I and  
my team have prepared for Arkansas Soil & Water  
Conservation Commission.  
**Q All right. Who are the other authors or**  
**persons on your team identified in this Exhibit 3?** 09:35AM  
A So from biological and agricultural  
engineering department, Dr. Tom Costello. He's an  
associate professor, and Dr. Kati White. She was at  
that time my PhD student. Since then she has  
graduated and become faculty member at University of 09:35AM  
Florida. Dr. Marc Nelson from Arkansas Water  
Resources Center, and Michelle Steele. She is an  
extension agent with Northwest Arkansas Cooperative  
Extension Service.  
**Q What was Dr. Nelson's role in this work that's** 09:35AM  
**being reported in Exhibit 3?**  
A He was leading there to collect water samples  
from Moore's Creek and Lincoln Lake.  
**Q You mentioned earlier that you've worked with**  
**him at the Arkansas Water Resource Center in the** 09:36AM  
**past; correct?**  
A Yes.  
**Q Do you have an opinion about his ability to**  
**collect and compile sampling data?**  
A He has very extensive experience and lots of 09:36AM

37

1 expertise. I've got very high regards for his  
2 abilities to collect water samples and analyze them.  
3 **Q In this reported study, did you rely then on**  
4 **his collection and compiling of water quality**  
5 **samples? 09:36AM**  
6 A Yes.  
7 **Q Do you know whether or not others at the**  
8 **Arkansas Water Resource Center rely on Dr. Nelson's**  
9 **collection and compiling of water quality samples?**  
10 A Others at the Water Resources Center or others 09:36AM  
11 at the university?  
12 **Q Either one or both.**  
13 MS. LONGWELL: Object to form.  
14 A Yeah.  
15 **Q They do? 09:37AM**  
16 A Yes.  
17 **Q Okay. What is the date of this publication;**  
18 **do you know approximately when it was published?**  
19 A I think it was published in 2005.  
20 **Q Okay. By looking at this report, do you know 09:37AM**  
21 **the dates of collection of the data that was used in**  
22 **this report?**  
23 A I think it went from 2001 to 2004.  
24 **Q All right. In your work in this particular**  
25 **study -- well, let me just look. I think the report 09:37AM**  
38

1 says that Moores Creek has been studied -- looking  
2 at Page 1, the second paragraph, and I'll quote,  
3 Moores Creek watershed has been monitored  
4 continuously from 1991 to 2004, except for a period  
5 from October '97 to December '98. Did you rely on 09:38AM  
6 any of the monitoring data that was collected during  
7 that period for this report?  
8 A Yes.  
9 **Q Tell the court, if you would, please, what**  
10 **were the general subject and objectives of the 09:38AM**  
11 **research that you performed as reported in Exhibit**  
12 **3.**  
13 A We wanted to continue to collect water quality  
14 data from Moores Creek and Lincoln Lake, and then we  
15 wanted to assess best management practices that were 09:38AM  
16 implemented in the watershed and how they were  
17 effective in improving water quality, and another  
18 goal was to prepare a watershed management plan and,  
19 you know, combine that with outreach training and  
20 numerous activities, and then compile that out into 09:39AM  
21 a project report that was submitted to the  
22 funding agency.  
23 **Q In the executive summary of this report at the**  
24 **-- I believe the third sentence it said sources of**  
25 **NPS, that would be non-point source pollution, in 09:39AM**  
39

the Ozark Highlands of Arkansas have been linked to  
agricultural activities in the area, and it cites  
Edwards and Daniel for 1992 and Edwards and others  
for 1997. Are you familiar with these gentlemen?  
A Yes. 09:39AM  
**Q Are you familiar with the work that's cited in**  
**this document?**  
A Yes. I had read the papers at that time.  
**Q All right. Based upon your knowledge,**  
**experience and review of that work, do you have an 09:40AM**  
**opinion whether the statement made by Edwards and**  
**Daniel is an accurate statement?**  
MS. LONGWELL: Object to form.  
MR. GEORGE: Object to form, speculation  
and calls for new opinion. 09:40AM  
A Yes.  
**Q What is that opinion?**  
A Agricultural activities in the areas are  
linked to elevated loads of nutrients.  
**Q When you say elevated loads of nutrients, 09:40AM**  
**elevated in relation to what?**  
A From what you can expect from undeveloped  
watershed.  
**Q Undeveloped watershed?**  
A Yeah. 09:40AM  
40

**Q All right. In that same paragraph it goes on**  
**to say, and I quote, there is ample evidence to**  
**suggest that excess land application of animal**  
**manures have led to surface and groundwater**  
**pollution due to increased runoff losses of 09:41AM**  
**nitrogen, phosphorus, sediment and pathogens, and it**  
**again reports or cites to Edwards in 1996. That's**  
**the same Edwards that you identified you knew?**  
A Yes.  
**Q Have you reviewed his study in 1996? 09:41AM**  
A Yes.  
**Q Based upon your own experience and work in the**  
**Illinois River watershed, do you believe that that**  
**statement is accurate?**  
MS. LONGWELL: Object to form. 09:41AM  
A Yes.  
**Q Since 1996 do you know whether or not there's**  
**been additional gathering of data to support the**  
**statement made by Edwards in your report in Exhibit**  
**3? 09:42AM**  
A There has been lots of data collected at  
different -- especially in this case.  
**Q And in your opinion has the data that's been**  
**collected support opinion that there is increased**  
**runoff of losses of nitrogen and phosphorus, 09:42AM**  
41

1	<b>sediment and pathogens occurring from the land</b>		A	We compared phosphorus load in this watershed	
2	<b>application of animal manures in the IRW?</b>			to other original watersheds, including Illinois	
3	MS. LONGWELL: Object to form.			River basin, some of the watersheds -- Beaver Lake	
4	A Some of the data that I've seen relate to			watershed, and what we found, that the range of the	
5	nitrogen, phosphorus and sediments, yes.	09:42AM		loads were very similar to these other watersheds,	09:46AM
6	<b>Q Okay, and have you seen data with regard to</b>			and if you partition the load between base flow and	
7	<b>bacteria runoff?</b>			storm flow conditions, majority of the phosphorus	
8	A I've not.			was being transported during storm flow conditions.	
9	<b>Q Have you reviewed published literature</b>			<b>Q Okay. Is storm flow conditions another term</b>	
10	<b>regarding whether the land application of poultry</b>	09:42AM		<b>for high flow conditions?</b>	09:46AM
11	<b>manure results in bacteria runoff in the Illinois</b>			A Yes.	
12	<b>River watershed?</b>			<b>Q All right, and were you able to determine the</b>	
13	A I've not.			<b>source of the nutrient loads that occurred during</b>	
14	<b>Q When this speaks to the use of animal manure,</b>			<b>storm events?</b>	
15	<b>do you know what that includes?</b>	09:43AM		A Since there is no point source present in the	09:47AM
16	MS. LONGWELL: Object to form.			Moore's Creek, the source of nutrients coming during	
17	A Animal manure includes poultry litter as well			storm flow were non-point sources.	
18	as manure from grazing animals in the pasture, such			<b>Q And so the court understands and so do I, what</b>	
19	as beef and dairy cows.			<b>generally are the non-point sources found in the</b>	
20	<b>Q All right. In your work in the Moore's Creek</b>	09:43AM		<b>Illinois River watershed, in particular Moore's</b>	09:47AM
21	<b>area, can you tell the court whether or not the</b>			<b>Creek?</b>	
22	<b>Moore's Creek watershed had what we refer to as a</b>			A So that broadly speaking, you know, you can	
23	<b>point source discharge or wastewater treatment plant</b>			have -- like any other watershed, there is always	
24	<b>contained within it?</b>			some background phosphorus present, and then land	
25	A Moore's Creek watershed does not have a point	09:44AM		application of poultry litter, manure from grazing	09:47AM
	42			44	
1	source discharge.			animals and then there may be some failing septic	
2	<b>Q All right, and did you yourself collect data</b>			systems in the watershed. So those will be probably	
3	<b>as part of this report in Exhibit 3 within the</b>			main categories in the watershed.	
4	<b>Moore's Creek watershed?</b>			<b>Q The main categories?</b>	
5	A Yes.	09:44AM		A Yes.	09:48AM
6	<b>Q What kind of data were you collecting?</b>			<b>Q Now, this refers to other watersheds. Let's</b>	
7	A We were collecting lots of sediment data, lots			<b>look at Page 27 of this Exhibit 3, and there's a</b>	
8	of water samples from Moore's Creek and biological			<b>table there. Does this Table 3 list the six</b>	
9	samples.			<b>watersheds that you were referring to in this</b>	
10	<b>Q Did you then analyze that data?</b>	09:45AM		<b>exhibit?</b>	09:48AM
11	A Yes, I analyzed some of the data. Some of the			A Yes.	
12	other data were analyzed by Dr. Marc Nelson from			<b>Q And so these are the six watersheds that you</b>	
13	AWRC.			<b>were comparing that were -- that form the basis of</b>	
14	<b>Q All right, and did the two of you collaborate</b>			<b>your previous response; is that true?</b>	
15	<b>then in preparing this report that we see as Exhibit</b>	09:45AM		A Yes.	09:48AM
16	<b>3?</b>			MS. LONGWELL: Object to form.	
17	A Yes.			<b>Q So that I understand also, tell the court what</b>	
18	<b>Q Based upon your analysis of the data, this</b>			<b>you mean by the term phosphorus transport when you</b>	
19	<b>says that on Page 5 -- if you'll look at Page 5 of</b>			<b>use that in this report describing phosphorus</b>	
20	<b>the report, it says at the last sentence of the</b>	09:45AM		<b>transport occurring during storm events.</b>	09:49AM
21	<b>first -- top of the paragraph there or at the top</b>			A It measures how much phosphorus is moving past	
22	<b>paragraph last sentence it says, quote, the P loads</b>			the monitoring station, and it includes phosphorus	
23	<b>for Moore's Creek is similar to other watersheds with</b>			that may be transported from landscape or hill	
24	<b>most of the phosphorus transport occurring during</b>			slopes into the stream and then within the stream	
25	<b>storm events. What does that mean?</b>	09:46AM		through the flowing water.	09:49AM
	43			45	

1	<b>Q</b> Okay. From this report then and based upon		was a preparation of a watershed management plan.	
2	<b>your knowledge, experience and professional review</b>		<b>Is this then that plan as shown in Exhibit 17?</b>	
3	<b>of published literature, do you have an opinion when</b>		A Yes.	
4	<b>most of the phosphorus transport from fields to</b>		<b>Q And did you contribute to the creation of</b>	
5	<b>water bodies occur in the Illinois River watershed?</b>	09:49AM	<b>Exhibit 17, the watershed management plan?</b>	09:53AM
6	MS. LONGWELL: Object to form.		A Yes.	
7	A Yes.		<b>Q Do you know who else may have contributed?</b>	
8	<b>Q And when is that or what is your opinion?</b>		A My team members, who are listed in the final	
9	MS. LONGWELL: Objection.		report on Exhibit 3.	
10	A From field to water bodies, it happens during	09:50AM	<b>Q All right. When you completed this watershed</b>	09:53AM
11	storm flow events.		<b>management plan, what did you do with the actual</b>	
12	<b>Q On Page 18 of your report, there is a</b>		<b>report; did you give it to somebody or distribute it</b>	
13	<b>statement I would like to ask you about in the first</b>		<b>in some form?</b>	
14	<b>sentence of the first full paragraph. It says, and</b>		A Yes. I submitted it to Arkansas Soil & Water	
15	<b>I quote, from a purely economic perspective,</b>	09:50AM	Conservation Commission. It's a new name now.	09:53AM
16	<b>producers are best served by avoiding best</b>		<b>Q Arkansas Natural Resource Commission?</b>	
17	<b>management practices. Did I read that correctly</b>		A Arkansas Natural Resource Commission, as a	
18	<b>from the first sentence there, Dr. Chaubey?</b>		part of the final report.	
19	A Yes.		<b>Q Have you reviewed this document before</b>	
20	<b>Q Can you tell the court what you meant by that</b>	09:50AM	<b>submitting it I assume?</b>	09:54AM
21	<b>statement in this report?</b>		A Yes.	
22	A We were looking at cost benefit analysis of		<b>Q Looking at Page 7, I want to ask you about</b>	
23	different best management practices and comparing		<b>some statements made there, and it says -- at the</b>	
24	that to the baseline, and I believe I have defined		<b>bottom paragraph starting with the second sentence,</b>	
25	the baseline somewhere here in this report. So most	09:51AM	<b>it says, and I quote, according to the University of</b>	09:54AM
	46		48	
1	of the best management practices, when you implement		Arkansas Cooperative Extension Service, parens, CES,	
2	them, they are going to cost money. So if you look		<b>end parens, only about 5 percent of the ration fed</b>	
3	at it strictly from that point of view, that's what		<b>to the cattle in northwest Arkansas is from off-farm</b>	
4	we meant.		<b>sources. I believe the first sentence says, and</b>	
5	<b>Q All right. Did you rely on others to assist</b>	09:51AM	<b>perhaps to put it in context, the impact of</b>	09:54AM
6	<b>you in making that determination?</b>		<b>unconfined cattle on water quality has not been</b>	
7	A The economic analysis was done by Dr. Jennie		<b>thoroughly researched in Arkansas as that of</b>	
8	Popp from University of Arkansas and her research		<b>confined animal manure management. I really kind of</b>	
9	associate, Herman Rodriguez.		<b>butchered this. I'm reading these all out of order.</b>	
10	<b>Q Did you confer with and review their work for</b>	09:51AM	<b>Let me start over. There's actually three sentences</b>	09:55AM
11	<b>purposes of your report shown in Exhibit 3?</b>		<b>there that put this in context. Let me start over,</b>	
12	A Yes.		<b>Dr. Chaubey, and I apologize.</b>	
13	<b>Q Did you agree with the work that they</b>		<b>Reading the first sentence again, the impact</b>	
14	<b>performed and the analysis that they concluded?</b>		<b>of unconfined cattle on water quality has not been</b>	
15	A Yes.	09:52AM	<b>thoroughly researched in Arkansas as that of</b>	09:55AM
16	<b>Q Let me hand you what has been marked as</b>		<b>confined animal manure management. It then says,</b>	
17	<b>Exhibit 17, Dr. Chaubey. Have you seen this</b>		<b>according to the University of Arkansas Cooperative</b>	
18	<b>document before?</b>		<b>Extension Service, CES, only about 5 percent of the</b>	
19	A Yes.		<b>ration fed to cattle in northwest Arkansas is from</b>	
20	<b>Q Can you tell the court what this document is?</b>	09:52AM	<b>off-farm sources; therefore, it may be safe to</b>	09:55AM
21	A It is watershed management plan for upper		<b>assume that pastured cattle do not contribute</b>	
22	Moore's Creek. It was part of the Moore's Creek		<b>heavily to the nutrient mass balance of the</b>	
23	project that you showed in Exhibit 3, and it was		<b>watershed. Can you tell me what that means?</b>	
24	prepared as a part of that project.		A What we meant was because there is not a lot	
25	<b>Q So one of the tasks of the report in Exhibit 3</b>	09:53AM	<b>of import of nutrients coming to feed the cattle in</b>	09:56AM
	47		49	

1 the watershed which are grazing, they are primarily  
 2 recycling the nutrients within the watershed.  
 3 **Q Okay. I'm going to change subjects on you a**  
 4 **little bit now. When you were at the Arkansas**  
 5 **Water Resource Center -- 09:56AM**  
 6 A Can we take a real quick break?  
 7 **Q We can take a break.**  
 8 MR. GARREN: We're going off the Record for  
 9 just a second and we'll be back shortly.  
 10 (Following a short recess at 9:56 p.m., 09:56AM  
 11 proceedings continued on the Record at 10:02 a.m.)  
 12 **Q Dr. Chaubey, when you were in the Arkansas**  
 13 **Water Resource Center working with them, did you**  
 14 **have an opportunity to do any work called or**  
 15 **referred to as mass balance? 10:02AM**  
 16 A Yes.  
 17 **Q Tell the court, basically what does mass**  
 18 **balance mean?**  
 19 A Mass balance involves -- basically it's  
 20 similar to balancing your checkbook, what comes in 10:03AM  
 21 and what goes out, and the difference is how much  
 22 gets accumulated. So we were doing that in the  
 23 context of nutrients, how much nutrients are getting  
 24 in the watershed, how much are getting out and then  
 25 what gets accumulated. 10:03AM

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1 **Q When you say we, who are you referring to?**  
 2 A Myself and my graduate student, and I had done  
 3 this work with Dr. Marc Nelson.  
 4 **Q What is the name of the graduate student that**  
 5 **did your work? 10:03AM**  
 6 A Kati White.  
 7 **Q Let's look at another exhibit here. I'll hand**  
 8 **you Exhibit 15. Have you seen that document before?**  
 9 A Yes.  
 10 **Q The document is entitled Illinois River 10:04AM**  
 11 **Phosphorus Mass Balance Computation Draft, and it**  
 12 **has the name of Dr. Nelson, Kati White and your name**  
 13 **on the front page. Just for the Record, I'll let it**  
 14 **note that this has a Bates number of an ADEQ 2007**  
 15 **915. Can you tell the court, if you would, please, 10:04AM**  
 16 **what is this document?**  
 17 A It was a draft report from the mass balance  
 18 study that we had done for phosphorus in the  
 19 Illinois River watershed.  
 20 **Q What was the time period this mass balance 10:05AM**  
 21 **work was being performed?**  
 22 A I believe we were looking from 1997 to 2001,  
 23 around that period.  
 24 **Q The data that's reported in this Exhibit 15,**  
 25 **do you know whether or not -- or what was the source 10:05AM**

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**of the data?**  
 A We looked at a number of sources for the data.  
 Water quality data came from Arkansas Water  
 Resources Center and Dr. Marc Nelson, and then we  
 looked at USDA agricultural statistics reports. We 10:05AM  
 looked at fertilizer sale data in the two counties  
 where this watershed is located in Arkansas. So  
 there were a number of different sources. Some of  
 the point source data came directly from the  
 municipalities that have got the best water 10:06AM  
 treatment plants in the watershed.  
**Q If we look over at the third page of this**  
**document, which is Bates number 0917, the title of**  
**this spreadsheet says Illinois River Phosphorus Mass**  
**Balance Inputs. Does this to your knowledge list 10:06AM**  
**the inputs that were identified and considered in**  
**your work?**  
 A Yes.  
**Q Tell the court, what generally are those**  
**inputs? 10:06AM**  
 A So they are in two different categories, point  
 sources and non-point sources. Point sources are  
 effluent discharge from four wastewater treatment  
 plants that are located in the watershed, and the  
 non-point sources are sludge application, manure 10:07AM

52

from different animals, including swines, hogs,  
 broilers, layers, turkeys, cattle beef, dairy, and  
 also inorganic fertilizer.  
**Q The numbers that are shown in columns across**  
**from the categories that you just described, what do 10:07AM**  
**they represent?**  
 A They represent the amount of phosphorus from  
 these different sources in different years from 1997  
 to 2001, and then various numbers for all these five  
 years. 10:07AM  
**Q And did the -- do I see in the last column of**  
**this document percentages; is that what is**  
**represented there?**  
 A Yes.  
**Q What are those percentages representing in the 10:08AM**  
**context of this document or this page?**  
 A In the mass balance, when you look at the  
 input, what its category represents as a percentage  
 of the total input.  
**Q And so each category then is summed to a 10:08AM**  
**percentage; is that what you're saying?**  
 A Yes.  
**Q And in the column just to the left of that,**  
**what does that column represent, the percentages**  
**that we see there? 10:08AM**

53



1 A They represent within each category what the  
2 percent is. For example, there are four wastewater  
3 treatment plants, so in terms of percentage, how  
4 much each is contributing. Sum total of the four is  
5 100. 10:09AM

6 Q Are the percentages that we see there, are  
7 they a total of the phosphorus that's listed in the  
8 years or is it based upon the average that is  
9 totaled or created in this document; do you know?

10 A Ask that again, please. 10:09AM

11 Q The percentages, the smaller percentages  
12 within the categories that are shown in the next to  
13 last column, are they based upon totals of these  
14 numbers or what, if you know?

15 A You know, I don't remember whether it was 10:09AM  
16 based on average or whether -- it may have been  
17 based on average but I'm not sure.

18 Q Okay. Tell us what the document says is the  
19 total inputs for the point source items listed  
20 there. 10:09AM

21 A Can you ask that again?

22 Q Can you tell me what the percentage reads on  
23 this document for the point source total input?

24 A It says 2.8 percent.

25 Q And in the non-point source categories, there 10:10AM  
54

1 is one for sludge. What is the percentage listed  
2 for sludge?

3 A It says 3 percent.

4 Q And then in the final category for what is sum 10:10AM  
5 of animal inputs of phosphorus, what is the  
6 percentage listed there?

7 A 91.9 percent.

8 Q And what do you see as the percentage for  
9 phosphorus input for fertilizer in this document?

10 A 5.1. 10:10AM

11 Q This is listed as a draft. Do you know  
12 whether or not additional drafts were created or  
13 not?

14 A There were some other drafts after this I  
15 believe. 10:10AM

16 Q Let me hand you what has been marked as  
17 Exhibit 16. Have you seen this document before?

18 A Yes.

19 Q And for the Record I'll note it's the same  
20 title, but at the bottom right-hand corner it has a 10:11AM  
21 Bates number OSRC 06921.

22 MS. SOUTHERLAND: Say the Bates number  
23 again, please, Rick.

24 MR. GAREN: OSRC 6921.

25 Q What is this document, sir, Dr. Chaubey, if 10:11AM  
55

you know?

A It is, again, a phosphorus mass balance  
computation, part of the same study, where it shows  
some figures and some tables with some of the  
calculations that we had performed for that study. 10:11AM

Q While you were working on this project, is  
this the kind of documentation that you would have  
been reviewing?

A Yes.

Q I notice this has on Page 6924 a graph. Just 10:12AM  
describe generally what this graph is portraying.

A It is showing concentration of total  
phosphorus that has been measured by Arkansas Water  
Resources Center from 1997 to 2001, and it is  
showing a trend in total phosphorus during storm and 10:12AM  
base flow conditions.

Q All right. The storm is represented -- storm  
flow is represented by the square symbol; is that  
correct?

A Yes. 10:13AM

Q And is that the upper -- is that the top line  
of the three lines that are portrayed on this chart  
or graph?

A Yes.

Q What is the middle line portraying? 10:13AM  
56

A It is portraying the -- I believe these are --  
it's hard to see in this figure -- diamonds, right,  
and that is portraying total phosphorus  
concentration for overall data.

Q All right, and so then the last -- the bottom 10:13AM  
line would be the base flow total phosphorus  
milligrams per liter?

A Yes.

Q All right. Did your name appear on the final  
version of the mass balance report when it was 10:13AM  
prepared?

A No, it was not.

Q Why was that; can you tell the court, please?

A The team wanted to present the results in  
annual conference of American Water Resources 10:14AM  
Center, and just there was not enough time for me to  
review the final set of calculations and reports,  
and so I voluntarily took my name off because of the  
time constraints and because of not having to review  
before it was presented. 10:14AM

Q All right. Was your choice to leave your name  
off -- did the contents of the report have anything  
to do with that choice?

MS. LONGWELL: Object to form.

A No. 10:14AM  
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1	<b>Q</b> Let me hand you what's been marked as Exhibit		include Flint Creek and Baron Fork.	
2	<b>8. Have you seen that document, Dr. Chaubey?</b>		<b>Q</b> All right. So if we look at Page 2, and there	
3	<b>A</b> Yes.		is a diagram of the watershed there, is there not?	
4	<b>Q</b> Tell the court what that document is.		<b>A</b> Yes.	
5	<b>A</b> It is Arkansas Water Resources Center report	10:15AM	<b>Q</b> And the darker portion of that diagram on the	10:18AM
6	titled Illinois River Phosphorus Sampling Results		Arkansas side is what you've referred to as that	
7	and Mass Balance Computation. That has been		<b>IRDA, the Illinois River drainage area?</b>	
8	prepared by Marc Nelson, K. L. White and T. S.		<b>A</b> Yes.	
9	Soerens.		<b>Q</b> All right, and the sampling that was conducted	
10	<b>Q</b> What was Dr. Soerens' involvement in the	10:15AM	in this IRDA, where were the sampling locations	10:18AM
11	<b>project for this mass balance?</b>		generally; was there only one, or was there more	
12	<b>A</b> I believe he was involved in review and		than one within this IRDA; do you know?	
13	discussion of some of the computational approaches		<b>A</b> Please ask that again.	
14	and results.		<b>Q</b> Do you know where the sampling gauges -- let	
15	<b>Q</b> When you were involved directly in this	10:15AM	me ask this: Do you know how many sampling gauges	10:18AM
16	<b>project, did you have discussions or conferences</b>		were utilized in this mass balance?	
17	<b>with him?</b>		<b>A</b> One.	
18	<b>A</b> Yes. I have talked to him about it a few		<b>Q</b> All right, and its location is where?	
19	times.		<b>A</b> At Highway 59 bridge.	
20	<b>Q</b> All right. Is this then the final report for	10:16AM	<b>Q</b> And is that the location at the border where	10:19AM
21	<b>the work that we talked about as partially depicted</b>		<b>the Illinois River enters the state of Oklahoma?</b>	
22	<b>in Exhibits 15 and 16?</b>		<b>A</b> Yes.	
23	MS. LONGWELL: Objection.		<b>Q</b> All right. There's a statement made at Page	
24	<b>A</b> Yes.		12 of this document I'd like to read to you and ask	
25	<b>Q</b> Have you read this report?	10:16AM	you what it means. The last sentence of that	10:19AM
	58		60	
1	<b>A</b> I have read it before, yes.		paragraph above the Table 5, it says, and I quote,	
2	<b>Q</b> Okay. Do you agree with the conclusions found		if the PS, that means point source, discharges were	
3	<b>within this report?</b>		reduced to zero, this analysis shows that the	
4	MR. GEORGE: Object to form.		combined concentrations would still greatly exceed	
5	<b>A</b> Yes.	10:16AM	<b>the standard. Did I read that correctly?</b>	10:19AM
6	<b>Q</b> Did the sampling events used in this project		<b>A</b> Yes.	
7	<b>of mass balance include high flow or base -- let me</b>		<b>Q</b> Do you know what the standard is that's being	
8	<b>just do it that way. Did the sampling utilized in</b>		referred to?	
9	<b>this project contain high flow data?</b>		MR. GEORGE: Object to form, calls for	
10	MS. LONGWELL: Object to form.	10:17AM	speculation.	10:20AM
11	<b>A</b> Yes.		<b>A</b> I believe it is referring to .037 milligrams	
12	<b>Q</b> Did it also have base flow or low flow data		per liter.	
13	<b>considered in it also?</b>		<b>Q</b> Look at Page 11, sir, if you would. In the	
14	MS. LONGWELL: Object to form.		very first sentence of that first paragraph, it says	
15	<b>A</b> Yes.	10:17AM	recently the Oklahoma Water Resources Board	10:20AM
16	<b>Q</b> Let's look at Page 12 of this document.		proposed, and the Oklahoma governor approved, that	
17	<b>Before we do that, so it isn't confusing, let's look</b>		<b>the Illinois River in Oklahoma be adopted as a</b>	
18	<b>at Page 2 because I think this is important to</b>		<b>scenic river in Oklahoma and there be a numerical</b>	
19	<b>understand. Tell the court what the study area was</b>		<b>in-stream phosphorus limit of .037 milligrams per</b>	
20	<b>for what is referred to as this mass balance</b>	10:17AM	<b>liter. Is that what you believe to be the standard</b>	10:20AM
21	<b>computation.</b>		<b>referenced on Page 12 that we talked about?</b>	
22	<b>A</b> The study area, we call it IRDA, Illinois		<b>A</b> Yes.	
23	River drainage area. It relates only to the portion		<b>Q</b> Now, let's go back to Page 12 and the table	
24	of the Illinois River watershed that drains through		<b>and that statement. Looking at the combined numbers</b>	
25	Highway 59 bridge sampling station, and it does not	10:18AM	<b>that are shown as -- well, let me back up. The</b>	10:20AM
	59		61	

1	<b>table is identified as current and potential</b>		the mass into concentrations to reflect that
2	<b>concentrations milligrams per liter at different</b>		scenario.
3	<b>point source discharges; is that correct?</b>		<b>Q All right. Are the land uses within that</b>
4	A Can you ask that again?		<b>subbasin quantified?</b>
5	<b>Q Is that the name of the table that I just</b>	10:21AM	A Yes. 10:24AM
6	<b>read?</b>		<b>Q Are the land types in the basin quantified?</b>
7	A The current and potential concentrations at		A What do you mean by quantified?
8	different point source discharges, yes.		<b>Q Well, whether it be pasture, urban.</b>
9	<b>Q All right. What are the different point</b>		A Yes, that's land use, yes.
10	<b>source discharges that are listed in this table that</b>	10:21AM	<b>Q All right. What was the largest land use</b>
11	<b>we're observing?</b>		<b>found in this IRDA?</b>
12	A The point source discharges from four		A Pasture.
13	wastewater treatment plants which are discharging in		<b>Q And what was the next largest land use or land</b>
14	the watershed.		<b>type?</b>
15	<b>Q All right. Looking at the combined levels</b>	10:21AM	A Forest. 10:24AM
16	<b>rather than base and storm, at the far right column</b>		<b>Q And do you know how large urban was in this</b>
17	<b>can you tell us what the heading WWTP at zero</b>		<b>IRDA?</b>
18	<b>MGL/L -- MG/L, can you tell me what that means?</b>		A It was not very large. It was in single
19	A It represents the concentrations that can be		digits. I don't remember. It may be somewhere in
20	expected when wastewater treatment plants are	10:22AM	the report, but less than 10 percent. 5 or 6 10:25AM
21	discharging phosphorus at zero milligrams per liter		percent, 6 percent.
22	concentration, in other words, no phosphorus		<b>Q What was the primary source of phosphorus on</b>
23	effluent coming from wastewater treatment plants.		<b>the pastures in this study area?</b>
24	<b>Q And so the number that's reflected there</b>		MR. GEORGE: Object to form, calls for
25	<b>reflects what; what is the source of the P</b>	10:22AM	speculation, and you are soliciting new opinions. 10:25AM
	6 2		6 4
1	<b>concentration listed then in that column if we have</b>		MS. LONGWELL: Object.
2	<b>zero effluence from the wastewater treatment plant?</b>		<b>Q Did you undertake a determination, sir, of</b>
3	A So that would be coming solely from non-point		<b>what the inputs were to pastures?</b>
4	sources.		A Yes.
5	<b>Q The combined non-point source discharges shown</b>	10:22AM	<b>Q And what did you do -- how did you do that?</b>
6	<b>in this column, is that the 0.246 number at the top?</b>		<b>10:25AM</b>
7	A Yes.		A So we looked at the possible sources that are
8	<b>Q And so that represents phosphorus that's been</b>		listed in one of the tables here in the mass
9	<b>sampled at the 59 Highway bridge as it discharges</b>		balance. We looked at the -- we looked at Page 6,
10	<b>from Arkansas in the IRDA as you've defined in this</b>	10:23AM	what are different significant animal sources there,
11	<b>study?</b>		and we found that to be hogs, swines, broilers, 10:26AM
12	MS. LONGWELL: Object to form.		layers, turkeys, cattle beef and dairy, and then we
13	<b>Q As to non-point sources. Let me rephrase</b>		looked at national agricultural statistics and
14	<b>that. As to the non-point source discharges, is</b>		Arkansas statistics numbers to determine how many of
15	<b>that the combined phosphorus concentration that was</b>	10:23AM	these units may have been present in different years
16	<b>sampled at the bridge at Highway 59?</b>		in the watershed. Based on that and based on the 10:26AM
17	MR. GEORGE: Object to form.		standards, we estimated how much manure was produced
18	A No. This was not sampled. This was an		and applied in the pasture areas. We also looked at
19	estimate that we can expect the concentrations to		inorganic fertilizer sale data and estimated how
20	be. So this was not a measured concentration. This	10:23AM	much of that may be applied in the watershed and
21	is what we estimated.		determined that number. 10:26AM
22	<b>Q All right, and how did that estimation occur?</b>		<b>Q All right. If we look at Table 2 on Page 6,</b>
23	A Looking at different point and non-point		<b>and let's just look at the year 1997 column under</b>
24	source contributions and then reducing the point		<b>the animals, what do you determine to be the largest</b>
25	sources by certain percentages and then converting	10:24AM	<b>contributor of the phosphorus in that -- under those</b>
	6 3		<b>categories?</b>
			10:27AM



MS. LONGWELL: Object to form.

MS. LONGWELL: Object to form.

**Q** What would be an example of some of those models that could be used?

A You can use a model like SWAT, a SWAT water assessment tool, and AGNPS, A-G-N-P-S, HSPF. There are a number of other models. 10:37AM

**Q Are you familiar with the GLEAMS model?**

A I am somewhat familiar with GLEAMS model, yes.

Q All right. If you used a GLEAMS model with a routing equation, could that be a type of model that could run the scenario we're talking about and determine the length of time we're asking about?

MS. LONGWELL: Object to form.

MR. GEORGE: Object to form, lack of foundation, calls for speculation. 10:38AM

A You can interface the GLEAMS model, which is a field scale model, with the routing model, to represent watershed processes and use that to answer these type of question. It is possible.

**Q** Okay. Have you had an opportunity to review **10:38AM**

**any data for water quality at the Highway 59 bridge after the mass balance of 2002 was performed?**

A I did some SWAT modeling in the same portion of the watershed where we utilized the data collected at Highway 59 bridge to calibrate and validate the model. 10:39AM

**Q** Was there a change that occurred with regard to the inputs after 2002 that you're aware of, the phosphorus inputs?

A Some of the point source numbers significantly changed. 10:40AM

**Q** And how did they change?

A The concentrations of phosphorus that was coming from the effluent discharged by the Springdale wastewater treatment plant decreased substantially, and I believe during similar time period, or it may have been slightly before that, dissolved solids also improved at the wastewater treatment plants and effluent discharge reduced from them also.

10:40AM

10:40AM

**Q With the reduction of the wastewater treatment plants, how would that impact the respective percentages of the inputs of point and non-point sources?**

MR. GEORGE: Object to form. 10:41AM

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19 (Pages 70 to 73)

19

1 A So if the total numbers that you measure at  
2 Highway 59 bridge does not change, if that stayed  
3 the same, then percentage of point source  
4 contribution would decrease and percentage of  
5 non-point source contribution would increase, but if 10:41AM  
6 the numbers go down similarly, then you may have to  
7 look at that data.  
8 **Q Okay. In your professional experience and**  
9 **review of published literature, are you aware of any**  
10 **published paper that contradicts the findings and 10:41AM**  
11 **conclusions shown in Exhibit 8?**  
12 MS. LONGWELL: Object to form.  
13 A No.  
14 **Q Based on the numbers on Table 2, Page 6 that**  
15 **you talked about earlier, the 1.8 million kilograms 10:42AM**  
16 **in 1997 versus the total input of 3.1 million**  
17 **kilograms, and based upon your knowledge, skill and**  
18 **education and training, including review of**  
19 **published literature, do you have an opinion whether**  
20 **poultry production practices of land applying waste 10:43AM**  
21 **is a substantial contributor of the phosphorus to**  
22 **the overall phosphorus loads within the watershed?**  
23 MS. LONGWELL: Object to form.  
24 MR. GEORGE: Object to form, vague, calls  
25 for an expert opinion that's not been found by this 10:43AM

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1 witness.  
2 A Yes.  
3 **Q And what would be that opinion?**  
4 MR. GEORGE: Same objection.  
5 A Based on inputs, poultry litter is the 10:43AM  
6 dominant source of phosphorus in the watershed.  
7 **Q All right. Is there anything else in your**  
8 **knowledge, experience that you rely on in making**  
9 **that opinion besides this Table 2?**  
10 MS. LONGWELL: Object to form. 10:43AM  
11 A Other litter from this watershed and other  
12 watersheds and published journals and reports from  
13 others.  
14 **Q All right. Let's talk a little bit about some**  
15 **terminology. Are you familiar with the term surface 10:44AM**  
16 **runoff and -- well, let me just ask that. Are you**  
17 **familiar with that term?**  
18 A Yes.  
19 **Q In a hydrologic concept, can you tell the**  
20 **court what that means? 10:44AM**  
21 A What it means is when it rains, part of the  
22 precipitation travels through the soil surface or  
23 land surface, and that is primarily the surface  
24 runoff. It can also represent some of the water  
25 that travels partially through the subsurface but 10:44AM

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emerges as a surface flow before it gets into the  
stream.  
**Q All right. Let me ask you about another term**  
**then, and that's infiltration. Can you tell the**  
**court what that term means? 10:45AM**  
A Infiltration is a process by which part of the  
precipitation enters the soil profile.  
**Q And I have one other term I want to ask you**  
**about, and it's called evapotranspiration. Can you**  
**tell the court what that means? 10:45AM**  
A So evapotranspiration is part of the water  
balance that gets sent back to the atmosphere via  
two different processes. One is the evaporation  
either from freestanding water or it could be from  
soil surfaces or from the water that is intercepted 10:46AM  
by canopy and then gets evaporated back into  
atmosphere, and second process is transpiration that  
represents the amount of water that plants  
transpire.  
**Q And that's transpired where? 10:46AM**  
A Back to the atmosphere, and the two terms  
combined represent evapotranspiration.  
**Q Okay. Other than -- and, again, in the**  
**context of hydrology, in a watershed, other than**  
**runoff, filtration or evapotranspiring, is there 10:46AM**  
**76**

**anything else that can happen to water that falls**  
**within that watershed as rain?**  
A These are dominant pathways, but it can be  
retained on the surface for extended period of time.  
So it depends on what is your time period of 10:47AM  
interest, and unless you are looking for a really,  
really long period of time, part of precipitation  
can be retained in surface depressions and may not  
be part of infiltration, runoff or  
evapotranspiration. 10:47AM  
**Q Okay. Other than those four possibilities, is**  
**there anything else that can happen to water that**  
**falls as rain on the land surface within the**  
**watershed?**  
A Not really. 10:47AM  
**Q All right. When rain water infiltrates, does**  
**it become considered part of the groundwater?**  
A Two things can happen after the infiltration.  
If it travels below root joint of the plants growing  
in the field, then usually it is considered to 10:48AM  
travel deep enough to be part of the groundwater.  
It is also possible that it can travel near surface  
but beneath the top of the surface as a lateral flow  
and really not contribute to the groundwater but,  
you know, appear back either in springs or become 10:48AM

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1	part of the runoff. So not all infiltrated waters		statement?	
2	becomes part of the groundwater. It depends upon		A Yes.	
3	how deep that it travel and what is the direction of		Q And is it a true statement?	
4	the travel. If it continues to go vertically, then		A Yes.	
5	we know it becomes groundwater. Otherwise, it may	10:48AM	Q Is there anything that may have occurred since	10:53AM
6	not.		1996 when this was published that would change your	
7	Q I think you said earlier, and so I'm clear,		opinion about the accuracy of that statement?	
8	can groundwater become surface water, like		A No.	
9	especially in the Illinois River watershed?		Q There is another statement that continues in	
10	A During base flow conditions, groundwater is	10:49AM	the second sentence in the introduction. It says,	10:53AM
11	what supports the stream flow in all the rivers. So		there is ample evidence to indicate that in general	
12	it is supporting surface flow during dry periods.		terms practices, such as row crop production and	
13	Q Is that the water that you might see that		animal manure application, can lead to increased	
14	seeps out of rocks near creek beds or streams; is		concentrations of nitrogen, phosphorus, solids,	
15	that an example of groundwater supporting surface	10:49AM	microorganisms and other substances in surface	10:53AM
16	water?		waters that receive runoff from agricultural source	
17	MS. LONGWELL: Object to form.		areas. Based upon your own knowledge, personal	
18	A Yes.		experience, study, investigation, review of	
19	Q Okay. Can surface water become groundwater in		published literature, do you believe that to be an	
20	the IRW?	10:49AM	accurate statement?	10:54AM
21	A In all watersheds, surface water can become		MS. LONGWELL: Object to form.	
22	groundwater in streams.		A Yes.	
23	Q Let me hand you Exhibit No. 4, Dr. Chaubey.		Q Is there anything since 1996 that you have	
24	Have you seen and are you familiar with this Exhibit		learned, studied or reviewed that would indicate a	
25	4 that's entitled A Report, Stream Quality Impacts	10:51AM	change in your opinion from agreeing with that	10:54AM
	78		80	
1	of Best Management Practices in Northwestern		statement?	
2	Arkansas Basin?		MS. LONGWELL: Object to form.	
3	A I have read this paper before.		A No.	
4	Q Okay, and do you know the primary author, D.		Q Dropping down in that same paragraph, it goes	
5	R. Edwards, listed there?	10:51AM	on to say, and I quote, the potential impacts of	10:54AM
6	A Yes.		excessive concentrations of pollutants, such as	
7	Q Are you also familiar with T. C. Daniel?		those just mentioned, are well known and include	
8	A Yes.		accelerated eutrophication, see for example,	
9	Q Are you familiar with any of the other authors		Sharpley, et al, 1994, and in extreme cases health	
10	listed here?	10:52AM	hazards to humans and/or animals. Based upon your	10:54AM
11	A I am familiar with H. D. Scott, J. F. Murdoch.		own knowledge, your investigation, research and	
12	I am not familiar with the last two authors.		review of published literature, do you agree that	
13	Q All right. This is the document that was		that's an accurate statement?	
14	cited earlier in Exhibit 3, your final report for		MS. LONGWELL: Object to form, calls for an	
15	optimizing BMPs that we talked about, is it not?	10:52AM	untimely opinion.	10:55AM
16	A Yes.		A Yes.	
17	Q Did you have confidence in this report when		Q Is there anything that's occurred since 1996	
18	citing it in your Exhibit No. 3 study?		that would change your opinion about the accuracy of	
19	A Yes.		that statement?	
20	Q The portion where it says introduction, the	10:52AM	MS. LONGWELL: Same objection.	10:55AM
21	very first sentence says that water quality impacts		A No.	
22	of agricultural production practices have been a		Q What are some of the human health hazards that	
23	matter of public concern in the United States for		you are aware of that can occur as a result of	
24	decades. Do you know from your own personal		excessive concentration of pollutants as mentioned	
25	experience, knowledge and training if that is a true	10:53AM	in this paper?	10:55AM
	79		81	



1 MS. LONGWELL: Object to form.	A Presence of bacteria in the water can make a
2 A The pathogens and bacteria, we know they are	person sick if that person drinks bacteria-infected
3 health hazards to humans for different contact and	water out of a stream and the water has high
4 for purposes of drinking water. There is water	concentration of bacteria and pathogens.
5 quality standard for nitrate. For example, if it is 10:55AM	<b>Q Let me hand you, Doctor, Exhibit No. 12. Are 11:09AM</b>
6 more than 10 milligrams per liter, we know it may	<b>you familiar with this document entitled Phosphorus</b>
7 lead to Blue Baby Syndrome. Pesticides, for	<b>SWAT Modeling in the Arkansas Portion of the</b>
8 example, we know that many of them have bad health	<b>Illinois River Drainage Area?</b>
9 consequences.	A Yes.
10 <b>Q What was that again? 10:56AM</b>	(Whereupon, a discussion was held off 11:10AM
11 A Pesticides. Nutrients, when the lead -- when	the Record.)
12 they cause eutrophication and excess algal bloom,	<b>Q Dr. Chaubey, tell the court what is a SWAT --</b>
13 may interfere with water treatment processes, and if	<b>let's start over. I think you said it earlier, but</b>
14 they're not removed before cloudiness, we know they	<b>so I'm sure, SWAT stands for soil and water</b>
15 form a compound called trihalomethane, or THM, that 10:56AM	<b>assessment tool I believe you said; is that correct? 11:12AM</b>
16 is a suspected carcinogen. So there are some	A Yes.
17 hazards that have been reported quite a bit in	<b>Q And what does -- what is SWAT; what does it</b>
18 literature.	<b>do; what is its function, if you will?</b>
19 <b>Q Why don't we take about a five-minute break</b>	A It's watershed model that has been developed
20 <b>here and let you stretch your legs and then we'll 10:57AM</b>	by USDA to evaluate effects of various land use and 11:13AM
21 <b>come back and resume. Okay?</b>	land management, climate forcing some hydrology and
22 A Okay.	water quality response at various time scales and at
23 MR. GEORGE: Rick, before we leave, do you	different points within the watershed.
24 think you're about done?	<b>Q Did you say it was developed by the USDA; is</b>
25 MR. GARREN: No. 10:57AM	<b>that what I heard you say? 11:13AM</b>
82	84
1 MR. GEORGE: I'm sorry?	A Yes.
2 MR. GARREN: No. I don't know how far	<b>Q All right, and how is it intended to be used?</b>
3 along I am. I've skipped some pages in my outline	A It was intended to be used in watersheds to
4 that I'll come back to. So I can't tell you.	make long-term watershed management decisions. It
5 MR. GEORGE: Send your outline to me and 10:57AM	also says that it can be used in ungauged basins, 11:13AM
6 I'll tell you whether you ought to go back.	basins where there is no major data available.
7 MR. GARREN: I'll do that. Look for an	<b>Q No major what?</b>
8 e-mail. Okay?	A Data available.
9 MR. GEORGE: All right.	<b>Q An ungauged basin, is that what you said?</b>
10 MR. GARREN: We'll take five minutes. 10:57AM	A Yeah. 11:14AM
11 (Following a short recess at 10:57	<b>Q Is this particular model widely used and</b>
12 a.m., proceedings continued on the Record at 11:08	<b>accepted by researchers and government agencies for</b>
13 a.m.)	<b>that purpose that you described?</b>
14 <b>Q Dr. Chaubey, when we left, you were speaking</b>	A In my opinion, it is the most widely used
15 <b>about some of the health hazards that can occur as a 11:08AM</b>	watershed model today. 11:14AM
16 <b>result of excessive concentration of pollutants as</b>	<b>Q And without making an assumption here, does</b>
17 <b>listed in the Edwards article at Exhibit 4. Does</b>	<b>that mean that it's an accepted method for</b>
18 <b>bacteria within the poultry litter or waste</b>	<b>evaluating P loading on a watershed scale?</b>
19 <b>constitute one of those health hazards?</b>	A Yes.
20 MS. LONGWELL: Object to form. 11:08AM	<b>Q Has SWAT been used by any other modelers to 11:14AM</b>
21 A Yes.	<b>evaluate P loading on a watershed scale?</b>
22 <b>Q What are some of the health hazards associated</b>	A Yes.
23 <b>then with bacteria in water?</b>	<b>Q Do you or did you follow the appropriate</b>
24 MS. LONGWELL: Object to form, calls for	<b>protocols for running SWAT in the IRW when you</b>
25 speculation. 11:09AM	<b>conducted your work? 11:14AM</b>
83	85



1	A Yes.		using the calibrated and validated SWAT model and	
2	<b>Q We're going to maybe talk about some of those</b>		the respective inflow phosphorus that would result	
3	<b>in a minute, but was the water quality data</b>		from these scenarios. We looked at four possible	
4	<b>collected pursuant to what's referred to as QAPP or</b>		reductions in non-point sources that was 25, 50, 75	
5	<b>subject to a quality assurance and quality control</b>	11:15AM	and 90 percent decrease in non-point loadings.	11:18AM
6	<b>protocol?</b>		<b>Q Those are the four items at the top of the</b>	
7	A Yes. All activities in the project were done		<b>table; correct?</b>	
8	as per the QAPP or QA/QC.		A Yes, and then we also looked at three	
9	<b>Q I think throughout this Exhibit 12 you</b>		reductions scenarios for point sources, point source	
10	<b>mentioned that calibration and validation was</b>	11:15AM	concentrations equal to 1, 0.5 and zero milligram	11:19AM
11	<b>conducted on the model; is that true?</b>		per liter, and we then looked at one combination, 25	
12	A Yes.		percent decrease in non-point loadings and point	
13	<b>Q And did you do it more than once; do you</b>		source effluent concentration of 1 milligram per	
14	<b>recall?</b>		liter.	
15	A Yes. We have done it a few times.	11:15AM	<b>Q So I can understand and hopefully help educate</b>	11:19AM
16	<b>Q Was this model and the results that you</b>		<b>those who might, like me, not fully understand what</b>	
17	<b>generated approved or accepted in any way by any</b>		<b>you're saying, in your scenarios are you saying that</b>	
18	<b>governmental agency?</b>		<b>the model was run for each scenario in order to</b>	
19	A Yes. We had submitted a report on SWAT		<b>determine the what-if and then the result?</b>	
20	modeling that we did in the watershed to Arkansas	11:15AM	A Yes. Model was run separately for each	11:19AM
21	Natural Resources Commission. It was reviewed by		scenario.	
22	them, and I believe it was also reviewed by EPA.		<b>Q All right, and so you changed the controls or</b>	
23	<b>Q If we look at Page 3 of your report, Exhibit</b>		<b>the switches that are within the model in order to</b>	
24	<b>12, the first full paragraph at the top, does this</b>		<b>change what is the scenario that's being examined;</b>	
25	<b>paragraph accurately describe the objectives of the</b>	11:16AM	<b>is that a correct analysis?</b>	11:20AM
	86		88	
1	<b>study and if so, tell us what they are.</b>		A We modified the input data files that	
2	A For the study that is reported in this paper,		represent these scenarios in the model.	
3	there were two objectives. First one was to		<b>Q So if we look at the last one on a decrease in</b>	
4	calibrate and validate the SWAT model for the IRDA,		<b>non-point loadings that's listed in Table 6, when</b>	
5	and the second objective was then to use the	11:17AM	<b>you say you modified the input files, do you reduce</b>	11:20AM
6	calibrated and validated model to look at some		<b>the amount of input by 90 percent in that scenario;</b>	
7	what-if scenarios, what if you do this in the		<b>is that what I should understand from this?</b>	
8	watershed, what can you expect in terms of hydrology		A Yes. What you do is go back and reduce the	
9	and water quality.		non-point source input that is going in the model by	
10	<b>Q What were the what-ifs or scenarios that you</b>	11:17AM	that percentage and then run the model for that	11:20AM
11	<b>were planning to and did, in fact, perform as</b>		scenario.	
12	<b>reported in this paper?</b>		<b>Q All right. We saw earlier in one of the</b>	
13	A In this paper we looked at some reductions in		<b>tables that there were inputs of phosphorus 1.8</b>	
14	point source discharges, and we also looked at some		<b>million kilograms. For example, is that a number</b>	
15	reductions in poultry litter application in the	11:17AM	<b>that you would reduce by 90 percent in that</b>	11:21AM
16	watershed.		<b>scenario; is that what you are doing?</b>	
17	<b>Q Okay. In your opinion, were the objectives as</b>		MR. GEORGE: Object to form.	
18	<b>stated in this report accomplished?</b>		A Yeah.	
19	A Yes.		<b>Q Okay. Once you have done these scenarios, the</b>	
20	<b>Q Let's turn over to Page 6, if we could,</b>	11:17AM	<b>column to the right says phosphorus or percentage</b>	11:21AM
21	<b>please, and there's a table there at Table 6. Do</b>		<b>phosphorus load reduction. What is that number</b>	
22	<b>you see that document and that table?</b>		<b>telling us for each of these scenarios?</b>	
23	A Yes.		A The numbers on the second column indicates how	
24	<b>Q Tell us what this table portrays or depicts.</b>		much reduction in the phosphorus that is leaving	
25	A It shows some of the scenarios that we modeled	11:18AM	Highway 59 bridge monitoring site can be expected as	11:21AM
	87		89	

1	it was predicted by the model.			Q And you link it with -- what is it you said?	
2	Q So in the same scenario that I pulled out, if			A A routing model.	
3	you have a 90 percent decrease in non-point loading,			Q A routing model?	
4	your model projected that the phosphorus --			A Yeah.	
5	percentage of phosphorus load reduction would then	11:22AM		Q Based on SWAT in your work in this, what is	11:25AM
6	equate to 54 percent reduction; is that correct?			the largest source of P loading that you found?	
7	A Yes.			MS. LONGWELL: Object to form.	
8	Q Now, tell us what you did on the -- to reduce			A Non-point sources.	
9	the point source concentration. How were those			Q Okay, and were you able to determine which of	
10	scenarios modified?	11:22AM		the non-point sources were the largest of those?	11:25AM
11	A So from all the four point sources in the			MR. GEORGE: Object to form.	
12	watershed, we had the dissolved rate and we had the			A It is difficult to parse out exactly, you	
13	concentrations. So we -- for example, when you look			know, each one of those sources. At least that's	
14	at the point source concentration to 1 milligram per			one limitation with some of the current models, but	
15	liter, we changed all the concentrations to 1	11:22AM		you can differentiate between point and non-point	11:26AM
16	milligram per liter at the reported discharge rate,			sources.	
17	and then we run the model.			Q Well, let's go this way then. I think I heard	
18	Q And then that model gave you the percentage			you say that pasture is the largest percentage land	
19	phosphorus load reduction in the right-hand column			use type; correct?	
20	for each scenario; correct?	11:23AM		A Yes.	11:26AM
21	A Yes.			MR. GEORGE: Object to form, asked and	
22	Q All right. Tell me then, when you did a			answered.	
23	combination, which is the last scenario, tell us			Q We saw earlier the inputs in the exhibit,	
24	exactly how that occurs.			which was for 1997 1.3 kilograms, and you indicated	
25	A So what that shows is -- and this was one of	11:23AM		that was the largest input; correct?	11:26AM
	90			92	
1	the scenarios we ran -- what will happen if you go			MS. LONGWELL: Object to form.	
2	and decrease the non-point source input by 25			A Yes.	
3	percent and decrease effluent concentrations to 1			Q And I think you've said earlier that the	
4	milligram per liter, what -- and it showed that a 43			typical and normal use of poultry litter is to land	
5	percent reduction in the phosphorus load at the	11:23AM		apply pastures; correct?	11:26AM
6	Highway 59 bridge gauging site can be expected.			MR. GEORGE: Object to form, leading.	
7	Q So in your -- the one scenario, which is a			MS. LONGWELL: Object to form.	
8	combination, that shows if you decrease the			A Yes.	
9	non-point by 25 percent and the point source at only			Q All right. You testified to that earlier, did	
10	1 milligram per liter as an input, the model tells	11:24AM		you not?	11:27AM
11	you you'll have a 43 percent overall reduction in			A Yes.	
12	phosphorus; is that correct?			Q All right, and based on that, can you	
13	A Yes.			yourself, based on your professional experience,	
14	Q All right. Are there other models that can do			training, education, working with SWAT, conclude	
15	similarly what you have done here with the SWAT	11:24AM		what might be the largest source contributor of	11:27AM
16	model?			those factors?	
17	MR. GEORGE: Objection.			MR. GEORGE: Object to form. The witness	
18	A There are a number of other models that can be			is being asked to offer an opinion that he's never	
19	used to get similar analysis done, and those are the			before formed in his connection with his work that's	
20	models that I mentioned earlier, HSPF model and	11:24AM		been discussed in this deposition, and it's untimely	11:27AM
21	AGNPS model, field scale model linked with an			and it's improper.	
22	industry model to represent water site processes.			Q You can answer the question.	
23	Q Okay, and a field scale model would be one			A There are some generalities that can be	
24	similar to GLEAMS?			deduced from parts of the watershed from other	
25	A Yes.	11:25AM		modeling activities that I've done and have been	11:27AM
	91			93	

1	reported in literature by others. Usually the		my masters thesis we looked at the losses of these	
2	losses are proportional to the input, with few		constituents, and the USDA project that I'm working	
3	exceptions that may be there.		on right now also involves these assessments.	
4	<b>Q In your SWAT model, when you reduce -- in your</b>		<b>Q And do they include the assessment for the</b>	
5	<b>scenarios you decrease the non-point loadings, did</b>	11:28AM	<b>entire watershed or only a portion of it?</b>	11:32AM
6	<b>you decrease all of them on the same percentage or</b>		A These include a portion of the watershed.	
7	<b>did you pick one or the other to make a decrease?</b>		<b>Q All right. Have you ever done an evaluation</b>	
8	A You know, it has been awhile since we did this		<b>or reviewed then literature that has evaluated the</b>	
9	study, but best of my recollection, we went and		<b>source of P loading to the entire Illinois River</b>	
10	decreased the poultry litter application rates in	11:28AM	<b>watershed?</b>	11:32AM
11	the watershed.		A Except this mass balance study, I am not	
12	<b>Q Was that the only reduction of poultry -- I</b>		familiar with any other watershed assessment.	
13	<b>mean, was that the only reduction of non-point</b>		<b>Q Are you, through your research, study, review</b>	
14	<b>loadings then that you performed in these scenarios?</b>		<b>of published literature, aware of any significant P</b>	
15	<b>Take your time and read the report if you need to</b>	11:29AM	<b>loading from land in the Illinois River watershed?</b>	11:32AM
16	<b>refresh your recollection.</b>		A Ask that again.	
17	MR. GEORGE: While the witness is reading,		<b>Q Based upon your studies, review of published</b>	
18	I didn't hear the last answer, Rick. Can you --		<b>literature, are you aware of any significant P</b>	
19	MR. GARREN: We'll read it back to you		<b>loading that has been determined that comes from</b>	
20	while he is reading.	11:29AM	<b>land in the Illinois River watershed?</b>	11:33AM
21	(Whereupon, the court reporter read		A Yes.	
22	back the previous answer.)		<b>Q Tell us what you've learned.</b>	
23	MR. GEORGE: Thank you, Lisa.		A For example, again, the Moores Creek	
24	A You know, again, it has been several years		watershed, which has got only non-point sources	
25	since we did this model application, but I believe	11:29AM	present in the watershed, the amount of phosphorus	11:33AM
	94		96	
1	the reductions in non-point sources represent		and other nutrients which are delivered represent	
2	poultry litter application scenarios.		the amount that is coming from the landscape.	
3	<b>Q Okay. The Exhibit 12 that we're dealing with</b>		<b>Q Is there any reason to believe that the rest</b>	
4	<b>is the Arkansas side in your Illinois River drainage</b>		<b>of the Illinois River watershed would behave</b>	
5	<b>area. Have you yourself evaluated the source of P</b>	11:30AM	<b>differently than the results you've seen in your</b>	11:34AM
6	<b>loading to the Illinois River watershed?</b>		<b>studies in your Illinois River drainage area or</b>	
7	A Can you clarify that?		<b>Moores Creek?</b>	
8	<b>Q Yeah. Well, the SWAT model that we're seeing</b>		MS. LONGWELL: Object to form.	
9	<b>here was applied only to a portion of the Illinois</b>		MR. GEORGE: Object to form, calls for	
10	<b>River watershed; correct?</b>	11:30AM	speculation.	11:34AM
11	A Yes.		A No. Land use and land management is similar,	
12	<b>Q Have you, though, made any other types of</b>		and so I would expect it to indicate a general	
13	<b>evaluation for phosphorus loading in the Illinois</b>		trend.	
14	<b>River watershed?</b>		<b>Q Dr. Chaubey, looking at the Table 6 again at</b>	
15	A Do you mean some other studies or do you mean	11:31AM	<b>Page 6, assuming your memory is correct with regard</b>	11:35AM
16	my personal observations? I am not clear about the		<b>to reductions from poultry in this model scenario,</b>	
17	question.		<b>if poultry is reduced by 90 percent in non-point</b>	
18	<b>Q And I'm not clear in my question so I'll make</b>		<b>loadings, is the resulting phosphorus load reduction</b>	
19	<b>it more clear. Based upon either your review of</b>		<b>then an amount of 54 percent; is that correct?</b>	
20	<b>published literature -- let's start over. Have you</b>	11:31AM	MR. GEORGE: Object to form, lack of	11:35AM
21	<b>done any specific studies in the Illinois River</b>		foundation, vague, calls for speculation.	
22	<b>watershed that evaluated the P loading to that</b>		A Yes.	
23	<b>watershed yourself?</b>		<b>Q If -- so if we look at the scenario above it</b>	
24	A The Moores Creek project, we looked at loading		<b>at 75 percent, if you reduced poultry inputs by 75</b>	
25	of phosphorus, nitrogen, sediments. Then in part of	11:31AM	<b>percent, what is the phosphorus load reduction that</b>	11:36AM
	95		97	

1	<b>your model tells you would happen?</b>		A	Well, I don't remember if we ran the same	
2	MR. GEORGE: Same objection.			scenarios or not, but we are running some scenarios	
3	A You can expect phosphorus load reduction to be			right now as part of my USDA project.	
4	about 43 percent.		<b>Q</b>	<b>Look at Page 21 and maybe you can explain to</b>	
5	<b>Q Let me hand you what's been marked as Exhibit</b>	11:36AM		<b>me what the graphic representation tells us on that</b>	11:41AM
6	<b>13, Dr. Chaubey. Do you know what this document is?</b>			<b>page. It's entitled Illinois River Watershed</b>	
7	A Yes. It is water response modeling in			<b>Arkansas, Subbasin Percentile Rankings Based on Swat</b>	
8	eleven-digit priority watersheds in Arkansas. It is			<b>Model Results, and then it has four categories</b>	
9	a final report that was prepared for this project			<b>there. What is this supposed to tell us?</b>	
10	and submitted to Arkansas Natural Resources	11:37AM	A	So one of the things that ANRC wanted us to do	11:41AM
11	Commission.			was to prioritize the subbasins in the watershed	
12	<b>Q Okay. What was the purpose of the project?</b>			that were contributing different amounts of flow,	
13	A We wanted to establish a baseline SWAT model			sediment, total nitrogen and total phosphorus, so	
14	in eight of the priority watersheds, and those			that it gives them a target for implementing best	
15	priority watersheds were determined by Arkansas	11:38AM		management practices or maybe funding 319 projects	11:42AM
16	Natural Resources Commission. So we wanted to			because not all areas are same and not all areas are	
17	establish a baseline SWAT model, and then I believe			representing same loadings. What they wanted us to	
18	use the SWAT model to prioritize some of the			do was use the SWAT model to rank, which are -- you	
19	subbasins based on flow, sediment, total nitrogen			know, you may call hotspots or areas that are	
20	and total phosphorus that could be focused for some	11:38AM		disproportionately contributing to flow sediment,	11:42AM
21	of the BMP implementation to reduce non-point source			total nitrogen, total phosphorus, so that they could	
22	pollution.			go and focus in those subbasins compared to the ones	
23	<b>Q Were you able to accomplish the project</b>			that were not contributing as much to the problem.	
24	<b>objectives?</b>		<b>Q Does the figure then 13 on Page 21 color code</b>		
25	A A number of watersheds did not have the data	11:39AM	<b>those subwatersheds in accordance to the four</b>		11:42AM
	98		100		
1	that was needed, so we identified those		<b>categories that are shown on this figure?</b>		
2	shortcomings, but for the watersheds where we had		A	Five categories. It is broken from zero to	
3	adequate data, we were able to do that, yes.			20, 20 to 40, and so on and so forth.	
4	<b>Q Was the Illinois River watershed one in which</b>		<b>Q But we have four categories of either flow,</b>		
5	<b>you had accurate data or sufficient data also?</b>	11:39AM	<b>sediment, total nitrogen and total phosphorus;</b>		11:43AM
6	A We had sufficient -- what we felt was		<b>correct?</b>		
7	sufficient data for the Illinois River watershed.		A	Yes, four outputs of interest here.	
8	<b>Q Who is Margaret Gitau, one of the authors?</b>		<b>Q So each of those subwatersheds are ranked in</b>		
9	A Margaret Gitau at that time was a research		<b>accordance to the five percentiles that you</b>		
10	associate working with me. Since then she has	11:39AM	<b>described?</b>		11:43AM
11	become faculty. She went to Purdue with me and		A	Yes.	
12	worked there for about a year. Now she is a faculty		<b>Q And in looking at this figure, are the</b>		
13	at Florida A & M.		<b>subbasins then reflected according to the</b>		
14	<b>Q All right. Is this describing the model</b>		<b>eleven-digit code as opposed to the eight-digit</b>		
15	<b>that -- let me ask you this: Was this model -- this</b>	11:40AM	<b>code?</b>		11:43AM
16	<b>work done on the model subsequent to your previous</b>		A	Yes.	
17	<b>modeling work that we talked about?</b>		<b>Q Okay. I'm going to hand you what's been</b>		
18	A Yes.		<b>marked Exhibit 14, Dr. Chaubey.</b>		
19	<b>Q Okay. Has the model been used by you since</b>		MS. SOUTHERLAND: Rick, was the last		
20	<b>it's been updated to the eleven-digit priority</b>	11:40AM	<b>exhibit you just got finished talking about Exhibit</b>		11:44AM
21	<b>watersheds?</b>		13?		
22	A That's what we tried to do here in this		MR. GARREN: It was.		
23	project.		MS. SOUTHERLAND: Thank you.		
24	<b>Q Have you applied the model to scenarios</b>		<b>Q Are you familiar with Exhibit 14, Dr. Chaubey?</b>		
25	<b>similar to what you described earlier in Exhibit 12?</b>	11:40AM	A	Yes.	11:44AM
	99		101		

1 Q And you're one of the -- in fact, you're the  
2 primary author of this document; correct?  
3 A Yes.  
4 Q When was the work done in this study; do you  
5 know? 11:44AM  
6 A This work was done in 1993, 1994.  
7 Q What was the nature -- first off, the document  
8 is entitled Assessment of Effectiveness of Buffer  
9 Zones in Removing and it says Impurities in Runoff  
10 From Areas Treated With Poultry Litter, does it not? 11:44AM  
11 A Yeah, there is a typo there. Impurities.  
12 Q Would that be impurities?  
13 A Yeah.  
14 Q All right. Tell us, what was it that you did  
15 in this research? 11:45AM  
16 A We looked at how vegetated filter strips or  
17 buffer strips can be used as a best management  
18 practice to filter sediment, nitrogen, phosphorus,  
19 pathogens and chemical oxygen demands from surface  
20 applied swine manure and poultry litter. 11:45AM  
21 Q Where was the study conducted?  
22 A It was conducted on a number of constructed  
23 plots within the Illinois River basin.  
24 Q Tell me generally what are the results that  
25 you learn from this study. 11:45AM

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1 A What we learned was -- I believe the  
2 conclusions are somewhere in the report here, but in  
3 general, vegetated filter strips were very effective  
4 in removing sediment, ammonium nitrogen, I believe  
5 total phosphorus and phosphoric phosphorus, as well 11:46AM  
6 as COD and bacteria from runoff that were coming  
7 from surface-applied poultry litter and swine  
8 manure, and we studied up to a length of 21.4  
9 meters. A significant portion of the constituents  
10 were retained within this land. First few feet were 11:46AM  
11 most effective, and for some of the parameters, we  
12 did not see as much effectiveness. For example, I  
13 believe it was for sediment, that we didn't see it  
14 to be as effective as other constituents.  
15 Q Okay. This document says in the abstract that 11:47AM  
16 this research involved characterizing performance of  
17 fescue vegetative filter strips in improving quality  
18 of runoff from pastureland areas treated with  
19 poultry litter and swine manure. At this time frame  
20 did you know that this runoff was occurring from 11:47AM  
21 poultry litter and swine manure?  
22 MS. LONGWELL: Object to form.  
23 A There were a number of published studies from  
24 work by Edwards and Daniel that had indicated that  
25 there is significant amount of losses from 11:47AM

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surface-applied poultry litter and swine manure.  
Q Okay. The report also says that the transport  
of suspended solids and chemical oxygen demand was  
also reduced by the vegetative filter strips but  
generally not to the extent of other litter and 11:48AM  
manure constituents. Can you tell me what those  
other manure or litter constituents were?  
A They were ammonium nitrogen, total nitrogen,  
phosphate, phosphorus, total phosphorus and fecal  
coliform. 11:48AM  
Q Do you know which ones were not as -- where  
the vegetative filter strips were not as effective,  
as to which constituents?  
A Sediment and chemical oxygen demand.  
Q All right. Can suspended solids include 11:48AM  
bacteria?  
A Suspended solids carry -- can potentially  
carry a number of other constituents, and bacteria  
can be or has been studied both as sediment in test  
form and, you know, equivalent to soluble form. 11:49AM  
Q Based upon your knowledge, experience and  
review of published literature, does bacteria travel  
besides in a suspended solid state?  
A It can travel --  
MR. GEORGE: Object to form. 11:49AM

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A It can travel in the dissolved -- equivalent  
to a dissolved form, yes.  
Q So when you say in dissolved form, would that  
be like a liquid state?  
A It is -- it's small enough that, you know, it 11:49AM  
is not retained on the filters.  
Q So it flows in the --  
A It will be similar to -- the behavior will be  
similar to what you would see in the dissolved  
nutrients, for example. 11:50AM  
Q All right. Looking at the introduction at  
Page 2, there's a statement there at the very top  
that says, and I'll read it, land disposal of animal  
manure is widely recognized as an economic means of  
productively using manure constituents as well as an 11:50AM  
effective disposal technique. Did I read that  
correctly?  
A Yes.  
Q And when you put this in your report, had you  
done any study or investigation to support that 11:50AM  
statement?  
MR. GEORGE: Object to form.  
A It was based on a number of papers that I had  
reviewed in conjunction with this study.  
Q So when your paper then is produced somewhere 11:51AM

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1	in '93 or '94, this -- these facts about land		land disposal of animal manure is widely recognized
2	disposal of animal manure was already known and		as an economic means of productively using manure
3	published; is that correct?		constituents, as well as an effective disposal
4	MR. GEORGE: Objection, leading.		technique. What do you mean by the term effective
5	A There were a number of papers that indicated 11:51AM		disposal technique? 11:55AM
6	this fact from around the country.		A What I mean by effective disposal technique is
7	Q Did those papers define animal manure?		how do you handle animal manure from these products
8	A Clarify that question for me, please.		and facilities, what gets done to them.
9	Q What was the term animal manure meaning when		Q All right. If a poultry grower or farmer is
10	you used it in your report of Exhibit 14? 11:51AM		land applying the poultry litter from the barn at a 11:56AM
11	A In a sentence like this where it is mentioned		rate in excess of the agronomic needs of the plants,
12	in general, it can be a wide, wide variety, you		the grass, is that what you coined the term for as
13	know, such as poultry, swine, dairy beef. The two		an effective disposal technique?
14	animal manure types that we studied for filter strip		MS. LONGWELL: Object to form, lack of
15	environments were poultry litter and swine manure. 11:52AM		foundation, calls for speculation. 11:56AM
16	Q Okay. The sentence further down in this		A So when you apply poultry litter to the
17	paragraph says, past research has demonstrated		pasture areas, you know, you are accomplishing both
18	potential runoff quality impacts of poultry litter		components here, productivity using manure
19	and swine manure application to pastures/range		constituents because it helps with some of the
20	areas, and it cites a study by Westerman in 1983, 11:52AM		nutrients, but at the same time you are also 11:56AM
21	McLeod and Hegg in 1984, Edwards and Daniel in 1992		disposing of the poultry litter from the houses,
22	and '93. Is that an example of some of the studies		which are produced to the surroundings areas.
23	then that you relied on in your work in Exhibit No.		Q And you say disposing of it. Why are you
24	14, among others?		talking about it in the two components?
25	A Yes. 11:53AM		A We have -- it has been recognized that poultry 11:57AM
	106		108
1	Q So do I read this then to mean or understand		manure has got some useful nutrients, that when
2	that as early as the 1983-'84 time range, runoff of		utilized properly can enhance crop production, but
3	animal manures was documented or known?		at the same time because of the nutrient imbalances,
4	MS. LONGWELL: Object to form.		you know, it can lead in to some potential problems,
5	A Yes. There were studies that were published 11:53AM		too. So that's why I'm using -- in this sentence 11:57AM
6	in the period that indicated this fact at that time.		using both components.
7	Q Looking at Page 6 of your report, there are a		Q If a poultry farmer is applying the poultry
8	couple of other studies reported there that go back		waste at a rate in excess of the agronomic needs, is
9	as far as '76 or '75. Did you review all of those		that an appropriate use as you've used the term?
10	in doing your work here; do you have a recollection? 11:54AM		MR. GEORGE: Object to form, calls for a 11:58AM
11	It's been awhile I know.		new opinion, lack of foundation, vague.
12	A I was on the top of the literature at that		MS. LONGWELL: Objection.
13	time, you know, being distributed. I read all those		A That is waste disposal in my opinion.
14	papers, yes.		Q Looking at Page 10 of your report, where it --
15	Q Okay. When you said that the land disposal of 11:54AM		in the first full paragraph in the middle it talks 11:58AM
16	animal manure is widely recognized and also that		about and says specifically and, I'll quote, under
17	it's an effective disposal technique, explain to me		concentrated flow conditions, however, vegetative
18	what that means.		filter strips' effectiveness was greatly reduced.
19	A Ask that question one more time, please.		Tell me what that means, if you would, please.
20	Q Look at Page 2 of the introduction, the very 11:54AM		A So when we designed these vegetative filter 11:59AM
21	top sentence.		strips, we designed them to have uniform seed flow,
22	A Okay.		and they are most effective under that condition.
23	Q You -- in that sentence you talk about the --		If the conditions change in a way that you have got
24	that it's recognized as an economic means that using		concentrated flow, such as small channels running
25	manure constituents -- I'll just read it. It says, 11:55AM		through the filter strip areas and flow is not 11:59AM
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1 distributed across the width, then their  
2 effectiveness can be expected to reduce  
3 significantly.

4 **Q Did you observe vegetative filter strips that**  
5 **had experienced the channelization that you just** 11:59AM  
6 **described in doing your study?**

7 A In my study, no. The flow conditions were  
8 uniform, and there were seed flow conditions, and  
9 how you would, you know, ideally hope that they  
10 would work. 12:00PM

11 **Q When you have a channelization occur, why is**  
12 **it there's a reduction in effectiveness?**

13 A Because of a number of reasons. Number one,  
14 you want the water to be spread across the width of  
15 the filter strips so that there is increased 12:00PM  
16 opportunity for infiltration to take place. Number  
17 two, you want them to have maximum contact with the  
18 sediment and with the plant so that there is  
19 enhanced opportunity for adsorption and, number  
20 three, you want the water to be moving through the 12:00PM  
21 filter width slowly so that some of these processes  
22 can take place. If it is in concentrated flow, it  
23 moves through a very small portion of the filter  
24 strip very, very rapidly, and none of the three  
25 processes get any great opportunity to take place. 12:01PM

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1 **Q As a result of that, the constituents go**  
2 **where?**

3 A So as a result of that, constituents may not  
4 be retained within the filter area and they may be  
5 delivered downstream. They may exit the filter 12:01PM  
6 strip area without much retention.

7 **Q Is there a point where a buffer strip, a**  
8 **vegetative filter strip will stop all runoff of the**  
9 **constituents of poultry litter?**

10 A There will always be some amount exiting. So 12:01PM  
11 I don't think it is realistic to think that you can  
12 design a buffer strip that will filter everything  
13 and retain everything within it. There will always  
14 be some going out. It may be a small portion of  
15 what goes in, but there will be some exiting the 12:02PM  
16 filter strip area.

17 **Q Have you continued since this time period of**  
18 **this report, Exhibit 14, to review, research and**  
19 **follow up on buffer strips and their use?**

20 A I read some papers from time to time. I 12:02PM  
21 cannot claim that I read all the papers that have  
22 been published on the topic, but I continue to read  
23 and review papers for different journals that are  
24 sent to me for peer review and for my opinion.

25 **Q It's a little after noon, Dr. Chaubey. Why** 12:03PM

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**don't we take a break here for lunch and we'll**  
**resume after that and I'll ask you some questions**  
**about some buffer strips some more.**

MR. GARREN: The people on the phone, are  
you guys going to be sticking around your office? 12:03PM  
Do we shorten our lunch period in order to help  
accommodate his schedule to leave today?

MR. GEORGE: What is Dr. Chaubey's schedule  
today?

MR. GARREN: His flight leaves at 5:30 from 12:03PM  
the Tulsa airport. So we have to leave here  
probably a little before 4:30.

MR. GEORGE: How much more do you have,  
Rick?

MR. GARREN: I anticipate a couple of 12:03PM  
hours.

MR. GEORGE: We may not have sufficient  
time for Dr. Chaubey, regardless of what we do with  
lunch, so --

MR. GARREN: Okay. So -- 12:03PM

MR. GEORGE: I'd say take a normal lunch  
break and we'll see where we are.

MR. GARREN: Okay. Be back in an hour or  
sooner?

MR. GEORGE: An hour would be fine. 12:03PM

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MR. GARREN: Okay.

MR. GEORGE: I need to check on a family  
without power over my lunch hour, so I'm going to  
try to do that.

MR. GARREN: We're back here at 1:00 or a 12:04PM  
little after.

(Following a lunch recess at 12:04  
p.m., proceedings continued on the Record at 1:20  
p.m.)

MR. GARREN: The parties, based upon 01:20PM  
agreement, have determined that this portion of the  
deposition will end and be resumed on March 2 at  
8:00 a.m. in order to allow Dr. Chaubey to get out  
of this airport due to inclement weather problems,  
and I'll resume my examination, and then we'll have 01:20PM  
a cross examination by the defendants at that time.

(Whereupon, the deposition was recessed  
at 1:20 p.m.)

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<p style="text-align: center;">SIGNATURE PAGE</p> <p>I, Indrajeet Chaubey, PhD, do hereby certify that the foregoing deposition was presented to me by Lisa A. Steinmeyer as a true and correct transcript of the proceedings in the above styled and numbered cause, and I now sign the same as true and correct.</p> <p>WITNESS my hand this _____ day of _____, 2009.</p> <p style="text-align: center;">_____ INDRAJEET CHAUBEY, PhD</p> <p>SUBSCRIBED AND SWORN TO before me this _____ day of _____, 2009.</p> <p style="text-align: center;">_____ Notary Public</p> <p>My Commission Expires: _____</p> <p style="text-align: right;">01:20PM</p> <p style="text-align: center;">114</p>	<p style="text-align: center;">CORRECTIONS TO THE DEPOSITION OF INDRAJEET CHAUBEY, PhD</p> <p style="text-align: center;">Volume I</p> <table border="1"> <thead> <tr> <th>PAGE AND LINE NUMBER</th> <th>CORRECTION</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">116</td> <td></td> </tr> </tbody> </table>	PAGE AND LINE NUMBER	CORRECTION	116	
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116					
<p style="text-align: center;">C E R T I F I C A T E</p> <p>STATE OF OKLAHOMA    )                                   ) ss. COUNTY OF TULSA    )</p> <p>I, Lisa A. Steinmeyer, Certified Shorthand Reporter within and for Tulsa County, State of Oklahoma, do hereby certify that the above named witness was by me first duly sworn to testify the truth, the whole truth and nothing but the truth in the case aforesaid, and that I reported in stenograph his deposition; that my stenograph notes were thereafter transcribed and reduced to typewritten form under my supervision, as the same appears herein.</p> <p>I further certify that the foregoing 114 pages contain a full, true and correct transcript of the deposition taken at such time and place.</p> <p>I further certify that I am not attorney for or relative to either of said parties, or otherwise interested in the event of said action.</p> <p>WITNESS MY HAND AND SEAL this 28th day of January, 2009.</p> <p style="text-align: center;">_____ LISA A. STEINMEYER, CRR CSR No. 386</p> <p style="text-align: center;">115</p>					

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